DOCUMENT RESUME

ED 285 017 CE 048 087

AUTHOR	Smith, Richard J.; Sauer, Mardelle A.
TITLE	CBT Pilot Program Instructional Guide. Basic Drafting Skills Curriculum Delivered through CAD Workstations and Artificial Intelligence Software.
INSTITUTION	Texas State Technical Inst., Waco.
SPONS AGENCY	Texas Coll. and Univ. System, Austin. Coordinating Board.
PUB DATE	30 Jun 87
GRANT	87-1030-A-7
NOTE	222p.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	*Artificial Intelligence; Authoring Aids (Programing); *Computer Assisted Instruction; *Courseware; *Curriculum Development; *Drafting; Pilot Projects; Postsecondary Education; *Trade and Industrial Education; Two Year Colleges
IDENTIFIERS	*Computer Assisted Drafting

ABSTRACT

This guide is intended to assist teachers in using computer-aided design (CAD) workstations and artificial intelligence software to teach basic drafting skills. The guide outlines a 7-unit shell program that may also be used as a generic authoring system capable of supporting computer-based training (CBT) in other subject areas. The first section explains the authoring system, which is based on the open architecture and interactive design capabilities of the AutoCAD Computer-Aided Design and AutoLISP Artificial Intelligence Systems. The following topics are covered in a programmer's reference guide to AutoCAD CBT: AutoLISP functions and usage; variables used by the system; system file formats; procedures for setting up the system; techniques for tracking student activities; teacher utilities; and listings of CBT AutoLISP, batch, and script codes. Outlines for instructional units on the following seven topics are provided: performing basic drawing operations, activating and using a mouse and digitizer pad to perform selected CAD drawing tasks, accessing and editing drawing files, drawing a construction from specifications, establishing and using layers, drawing entities and blocks, and plotting a drawing. Each unit outline contains terminal and enabling objectives. A screen-by-screen illustration of the 7-unit course is also included. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

87-1030-A-7

TX8713302

BEST COPY AVAILABLE

ED285017

CBT Pilot Program

INSTRUCTIONAL GUIDE

Basic Drafting Skills Curriculum
Delivered Through CAD Workstations
And Artificial Intelligence Software

1030: A

Mr. Richard J. Smith
Project Director

Mardelle A. Sauer
Project Coordinator

JUNE 30, 1987

TEXAS STATE TECHNICAL INSTITUTE

TSTI WACO

CE048087

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

P W Lindsay

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

FINAL REPORT

Curriculum Development Project
Basic Drafting Skills Curriculum
Delivered Through Cad Workstations
and Artificial Intelligence Software

Submitted by Mardelle Sauer
Drafting and Design Technology
Texas State Technical Institute
Waco, Texas
June 30, 1987

OVERVIEW

This curriculum development project has enabled the participants to design the algorithm, develop a curriculum, design and test a model, and define the equipment and resource requirements which demonstrate that a CAD workstation can be used as the primary delivery vehicle for teaching basic drafting skills. It is evident that the same "shell" program designed for this project may be utilized as a generic authoring system capable of supporting Computer Based Training (C.B.T.) in other subject areas. The resultant "ACAD-CBT" program provides educators with the ability to design and present instruction on a CAD workstation and to effectively measure student proficiency in the acquisition of skills.

AUTHORING SYSTEM

The project has accomplished its goals by developing an authoring system based on the unique open architecture and interactive design capabilities of the AutoCAD Computer Aided Design and AutoLISP Artificial Intelligence software. It is feasible in part because of the ability of AutoCAD and AutoLISP to search, compare, and identify lists and entities prescribed by the educator. The simplicity of use and complex graphics capabilities of this authoring system are unique to the microcomputer at this time. The CBT system is an applications program that will serve educators in many fields of endeavor.

INSTRUCTION

The unit of instruction is accessed through the AutoCAD program and is driven by AutoLISP code, control files and custom menus. Prompts and graphic displays are generated interactively based on responses by the students. It does not require any knowledge of programming on the part of future course authors. The design of a unit of instruction will require a knowledge of the AutoCAD program to take full advantage of the ACAD-CBT system capabilities. Resource persons could be identified to perform the actual production of files based on the design of the course author. It does not require any knowledge of computer operation or CAD by students. Instructions for the operation of the program are included in the CBT presentation. Minimal supervision is required for students and the system can be described as a "user friendly" computer based method of instruction.

===

Examples:

===

1. **AutoLISP Code -**

```
; (prompt "\nLoading AutoCAD CBT Software.  Please Wait.")
  (vmon)
  (setvar "CMDECHO" 0)
```

2. **Control Files -**

   CBT.LSP file contains the primary LISP control programs.
   CBTINS.LSP file contains the instructional LISP program.
   CBTTST.LSP file contains the test administration LISP program.

3. Custom Menus -

Main Menu

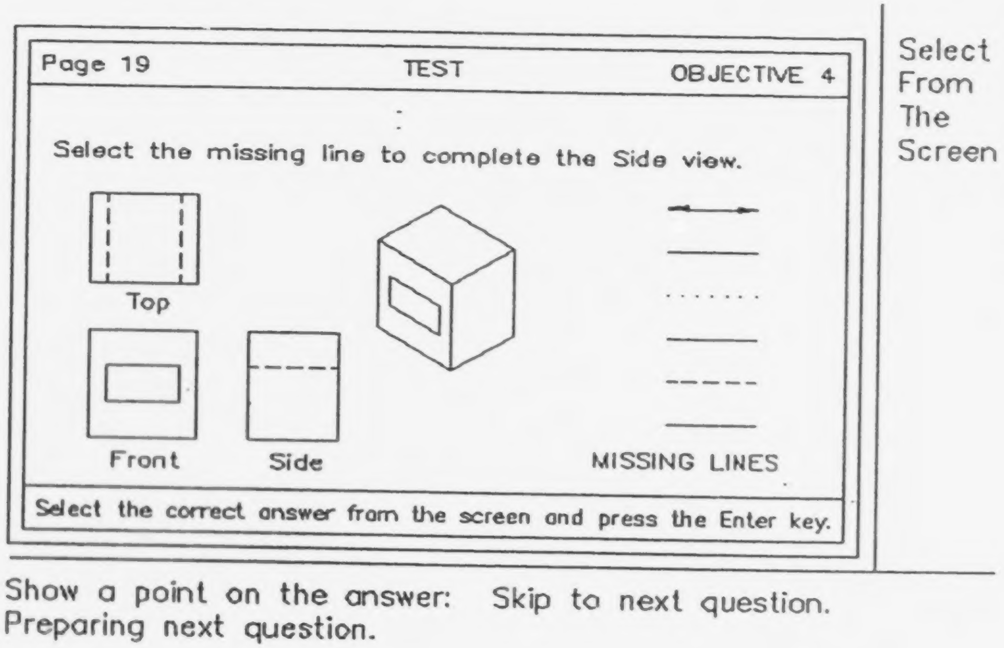
```
ACAD-CBT
--------
Object 2      (Enabling Objective being accessed.)
========

Instr.        (Command to access Instruction slides.)

PreTest       (Command to access performance Test files.)
               Note:  No remediation will be given.
Test          (Command to access performance Test files.)

Previous      (Command to access previous Enabling
               Objective 1.)
Next          (Command to access next Enabling Objective 3.)
Help          (Command to access Help slide.)

Quit          (Command to Quit (exit) program.)
--------
```

Instruction Menu

```
ACAD-CBT
--------
T.S.T.I.
========

EnabObj2
========

Previous      (Command to access previous slide.)
Next          (Command to access next slide.)
MoreInfo      (Command to access supplementary slide.)
CBT Help

Practice

Quit
--------
```

4. **Prompts -**

"Please wait, loading test drawing."
"Press Return key to continue."
"What would you like to do?"
"Select Next to continue class."
"Sorry, no more information is available."
"Show a point on the answer."
"Nothing near select point, try again."
"Wrong, try again."
"Correct!"
"You have completed the entire test!"
"Type CBT to restart system."
etc.



Page 19 TEST OBJECTIVE 4

Select the missing line to complete the Side view.

Select the correct answer from the screen and press the Enter key.

Show a point on the answer: Skip to next question.
Preparing next question.

ACAD-CBT SYSTEM

The ACAD-CBT system is composed of several types of files which remain as the core of the program and do not require editing. They include LISP (.LSP), batch (.BAT) and script (SCR.) files These files are referred to as the shell of the authoring system. Additional files are created by the author with a text editor such as Edlin, and the teacher utilities available in the ACAD-CBT system. The system (.LSP) files designated as teacher utilities allow the author to coordinate AutoCAD and text files. The utility files facilitate the creation of test text files within the AutoCAD editor and create a report detailing the files used in a CBT class. The utility files are composed of macro commands facilitated by artificial intelligence. They generate control files based on responses by the author. The files created for each unit of instruction are called class control files and are identified by the .CBT filename extension. The class control files contain lists of filenames, menus, answers, response commands, and remedial slides. The class control files also include the names of the enabling objective, instruction, practice and test files. The class control files designate the level of test and instruction, number of responses allowed and the percentage of correct responses required for proficiency. The AutoLISP program creates "Master" and "Datetime" files at the time the student exits from the program. The master files record the information accessed, as well as data on time and date of all student entries into the system, for future access by the instructor.

==

Examples:

==

1. **Lisp Files -**
   CBT.LSP
   CBTINS.LSP
   CBTTST.LSP

CONTROL FACILITIES

The class control files may be defined by the author to allow the student to attempt each test problem a specified number of times, or attempt without limit. The student will progress only upon selection of the correct answer. The student is presented with a custom menu for each test screen. The student response can be made through the menu, or by selecting an entity on the screeen. The system also allows the student to skip forward or quit the session at any time, return to the instruction slides, advance to the next objective within the unit, or exit the program.

===

Examples:

===

1. **Control Files -**

```
TESTING.CBT
OBJECT1 QUIZ1 0 100  (No limit to number of attempts, no
                       minimum score.)

OBJECT2 QUIZ2 0 100
******** TEST 3 85 (Limit of three attempts, 85% score to
                    pass.)
```

Batch File -

CBT.BAT

```
:cbtst
echo off
echo  (                    C. B. T.                              )
echo  (                  AutoCAD CBT                             )
echo  (                    T.S.T.I.                              )
echo  (                                                          )
echo  (                                                          )
echo          Insert STUDENT floppy into A: drive.
echo     ------------------------------------------------------------
echo     Press Ctrl-C to stop, any other key to enter CBT System.
echo     ------------------------------------------------------------
pause
rem      Optional Class information and file details on A: drive
                           copied to C:
rem      Note:  STUDENT.CBT must copied to hard drive!
copy a:STUDENT.CBT
copy a:*.cbt
copy a:*.dwg
copy a:*.sld
rem
rem      Set up AutoLISP environment.  Heap at 40k, stack at 5k.
set lispheap=40000
set lispstack=5000
echo            Loading AutoCAD Software system.
rem      Start AutoCAD with file named CBT, script file CBT.
acad cbt cbt
echo           (------------------------------------------)
echo           (  Thank you for using the ACAD CBT system. )
echo           (------------------------------------------)
rem      Copy the STUDENT.TXT result file to floppy.
copy STUDENT.CBT A:
rem
rem      Time Recording Options.
rem
rem          {   copy a:master.cbt
rem  Floppy  {   erase a:master.cbt
rem          {   copy master.cbt+datetime.cbt a:master.cbt
rem
rem  Hard disk.   {Active}
erase master.bak
rename master.cbt master.bak
copy master.bak+datetime.cbt master.cbt
copy master.cbt+datetime.cbt a:
goto cbtst
```

2. **Script File -**

CBT.SCR

```
2 CBT
(load "CBT")
(load "CBTINS")
(load "CBTTST") cbt
```

Teacher Utility Files -

CBTREPT.LSP
"CBTREPT   CBT File Status Report
CBT TEACHERS TOOL ROUTINE!
<Do not leave on system when CBT program complete!>
Displays the CBT file structure for review and preparation purposes. A complete list of class files is provided with a check for existence.

CBTLRN1.LSP
"CBTLRN1   Test Builder
Build test interractively

3. **Class Control Files -**

STUDENT.CBT
John Q. Student   TESTING 2 0
0123456789012345678901

TESTING.CBT
OBJECT1 QUIZ1 0 100
OBJECT2 QUIZ2 0 100
******** TEST 3 85

OBJECT2.CBT
P O2I1 (Primary instruction slide filename.)
S O2IA (Secondary instruction slide filename for optional viewing.)
S O2IB
S O2I1C
P O2I2
S O2I2A
S O2I2B
P O2I3
etc.

```
QUIZ3.CBT
Q O3P1           (Drawing filename.)
M 1¦2¦3          (Custom menu.)
A 2              (Correct answer.)
Q O3P2
M 1¦2¦3
A 3
Q O3P3
M A¦B¦C¦D¦E¦F¦G¦H
A E
Q O3P4
M Select¦From¦The¦Screen
A (3.1196 5.6147)    (Absolute coordinate of correct answer.)
etc.
```

```
TEST.CBT
Q T15                         (Drawing filename.)
M Select¦From¦The¦Screen      (Custom menu.)
A (9.0000 1.5000)             (Absolute coordinate of correct
                               answer.)
R TEXT 9.75,1.75 .25 0 Side   (Interactive response to display
                               text.)
I O3I6A                       (File to display for review
                               remediation.)
Q T16
M Select¦From¦The¦Screen
A (9.0000 4.0000)
R INSERT TOP 10.0,3.75 ; ;    (Interactive response to display
                               object.)
I O3I6C
etc.
```

4. **Master Files** -

MASTER.CBT (Record of all access to ACAD-CBT system.)

```
  BETA TEST FILE 2     TESTING2 07/07/87 12:56:49
12:59:33 13:04:37 5.064 min. TEST TEST2 16 tries with 16%
Eff.Rtng: 0.8000
BETA TEST FILE 2     TESTING2 07/07/87 13:12:04
15:34:28 15:39:33 5.082 min. INST OBJECT3
15:39:34 15:47:05 7.529 min. PRTC QUIZ3 0 tries with 0%
Eff.Rtng: 0.000
15:47:51 15:52:06 4.255 min. TEST TEST2 7 tries with 100%
Eff.Rtng: 0.700
```

MASTER.BAK (Record not including the most recent access.)

```
  BETA TEST FILE 2     TESTING2 07/07/87 12:56:49
12:59:33 13:04:37 5.064 min. TEST TEST2 16 tries with 16%
Eff.Rtng: 1.0000
```

5. **Datetime File** -

DATETIME.CBT

```
15:34:28 15:39:33 5.082 min. INST OBJECT3
15:39:34 15:47:05 7.529 min. PRTC QUIZ3 0 tries with 0%
Eff.Rtng: 0.0000
15:47:51 15:52:06 4.255 min. TEST TEST2 7 tries with 100%
Eff.Rtng: 1.0000
```

STUDENT TRACKING

The ACAD-CBT program includes a tracking facility to record each student's activity in the program by student name. The student's individual file is updated as progress is made through the unit of instruction. The facility keeps a record of the date and time of student entry, exit from the program and the elapsed time. It also records the names of the files prescribed within the unit of instruction, grade, test question attempted, and efficiency. These files are available as a permanent record for each student on their personal file diskette. They are also recorded on the workstation hard disk for teachers to monitor in order to assess student grades, progress and performance efficiency. A hard copy may be printed from the "Master" files stored on the hard disk of the workstation. Individual student progress is accurately tracked through this recording system.

Examples:

1. **Student Files -**
   John Q. Student Testing 2 0 (2=Test level, 0=instruction level.)

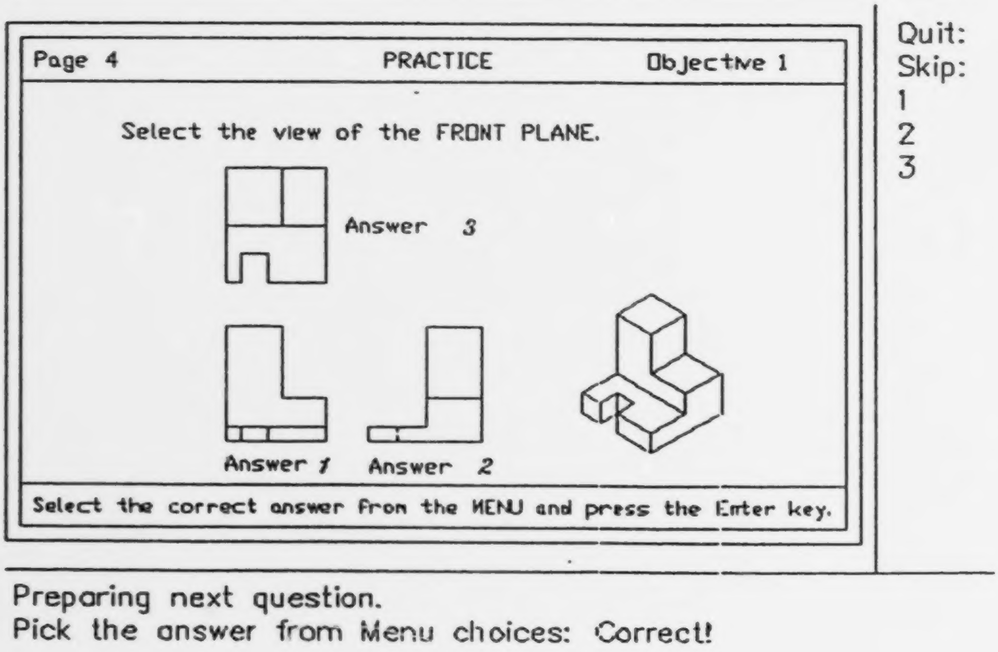
COMPUTER BASED TRAINING PROGRAM

The ACAD-CBT shell program is composed of two elements that include instruction and testing. The "Instruction" portion of the program presents individual slides composed of text and graphics, that can be reviewed by the student. The instruction is self-paced. The "Test" portion of the program presents INTERACTIVE files, also composed of text and graphics. These interactive files test the student on concepts presented in previous instruction slides. Screen display and prompts change as a result of student responses. Changes in the display include text and graphics that are produced by an AutoCAD command or series of commands. This interactive display may include text generation, movement of objects, or other graphics capabilities.

===

Examples:

===



Page 4 PRACTICE Objective 1

Select the view of the FRONT PLANE.

Select the correct answer From the MENU and press the Enter key.

Preparing next question.
Pick the answer from Menu choices: Correct!

These display features are author-designated. The test facility includes a pre-test, a practice quiz and a comprehensive performance test that provides immediate reinforcement. The test facility enables remediation at the conclusion of the test sequence. The "shell" is designed to support individualized instruction by allowing the author to design a unique sequence of instruction for the student. Similiarly, the shell will allow the author to design a unique sequence of instructional units to form a course. A library of diskettes containing instructional units could be made available for instruction, remediation or enhancement activities.

Examples:

1. **Files Included in "Shell" program -**

*.LSP	(All lisp program and teacher utility files.)
*.CBT	(All controll files.)
*.BAT	(CBT startup from DOS introduction file.)
*.SCR	(CBT startup for Autocad to load .LSP files.)
*.DWG	(All "Master Acad drawing (1) Practice and Test" files.)
*.SLD	(All "Instruction, Master Menu (1), Help, and Review" files.)

AUTOEXEC.BAT (Custom Root Dir. file to set the heap and stack.)

```
echo off
Prompt=$p$g
Date
Time
set lispstack=5000
set lispheap=40000
```

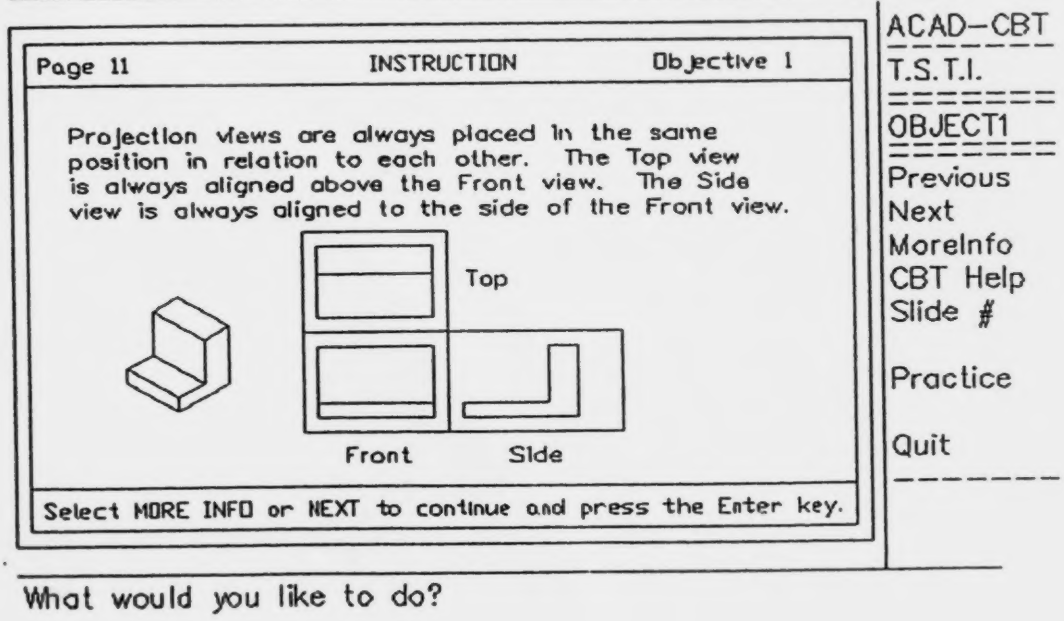
INSTRUCTION FACILITIES

Instruction slides are produced from drawing files in the AutoCAD editor and may contain text, graphics, or combinations thereof. The instruction portion of the presentation is composed of two types of slides. Primary slides of instruction are presented as "Page #". Supplementary slides of instruction are presented as "Page #x". These slides are presented in sequence through student selection from the instruction menu. The supplementary slides may be designed by the author to accommodate several levels of instruction. They may present basic, advanced, or remedial information. This feature enables the author to design a multi-level course of instruction. The Instruction slides may be viewed by the student in several ways. In order (MoreInfo) or (Next), reverse order (Previous), or skipped (Next) by selecting the command from the menu. They may also be accessed at random by identifying the slide number (Slide#). These features allow the student to progress or review with unlimited access to the complete presentation of instruction.

==

Examples:

==



Page 11 INSTRUCTION Objective 1

Projection views are always placed in the same position in relation to each other. The Top view is always aligned above the Front view. The Side view is always aligned to the side of the Front view.

Select MORE INFO or NEXT to continue and press the Enter key.

What would you like to do?

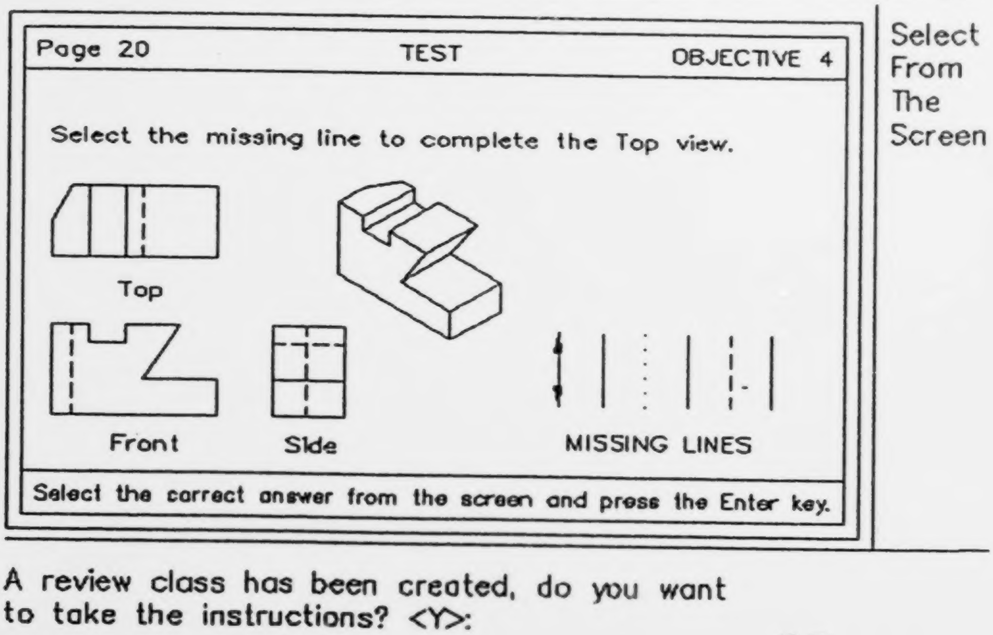
TESTING FACILITIES

Test files are also produced in the AutoCAD drawing editor and may contain text and graphics. An additional feature of the test facility is the interactive display of predetermined text and graphics based on student response to individual questions. The "Test" facility is available to "Pre-Test", "Practice" or take the form of a "Performance" test. This enables the student to pre-test, without remediation, for advanced standing prior to instruction. Pre-test and performance tests are available from the main menu; however, practice tests are only available from the instruction menu. Practice tests reinforce instruction and prepare the student for the performance test. Each test file contains a custom menu designed by the author and is located in the control file. The test facility gives the student immediate feedback by providing a percent grade, the number of attempts, the number of correct answers, and performance efficiency. If a failing grade is recorded, as an option the author may designate remedial instruction slides as part of the control file. The "REVIEW" sequence is based on the "I" slides listed in the test file.

==

Examples:

==



Page 20 TEST OBJECTIVE 4

Select the missing line to complete the Top view.

Select the correct answer from the screen and press the Enter key.

Select From The Screen

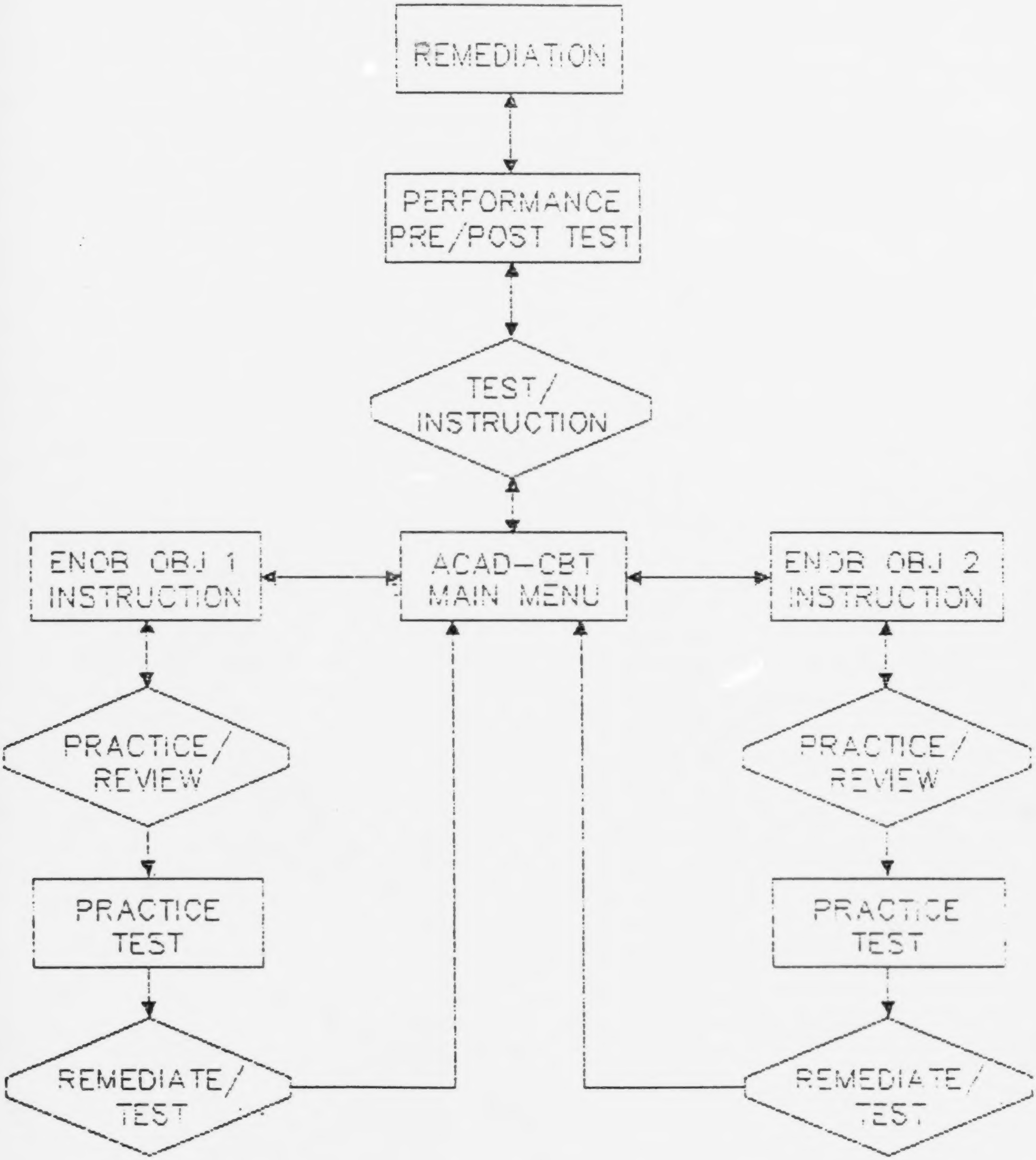
A review class has been created, do you want to take the instructions? <Y>:

DESIGN MODEL

(CBT Pilot Program Unit of Instruction in Basic Drafting)
The practice test does not limit the number of attempts. The students have the opportunity to test their skill until the problems are solved with 100% accuracy. In contrast, the performance test does limit the number of attempts, and advances automatically. The performance test allows a limited number of attempts (three), and then reinforces the correct answer before advancing to the next screen. As mentioned above, the student may select answers to individual questions by selecting from the menu, or by picking entities. Selection is through the use of the keyboard or other peripheral devices such as a digitizer. Each part of the test facility (practice and performance) may be written to enable it to reinforce the correct response and provide remediation. Upon unsatisfactory completion of the test the student is presented with a review of instructional slides to reinforce any incorrect answers or questions which were skipped without being attempted. The tests include several methods of reinforcement. The author may employ the "responsive graphic display" based on commands from the AutoCAD program. This model is only one example of the possible configurations of a testing facility.

CONCLUSION

This curriculum development project has produced the first authoring system of its kind for CAD workstations. Field tests have shown that educators in secondary and post-secondary schools are enthusiastic about the possible applications of the ACAD-CBT system in their classes. The technology available through this combination of programming is capable of being modified and expanded to include a wide variety of applications in other subject areas. The ACAD-CBT system is acceptable to students and has met with a high degree of success as a delivery system. As a result, TSTI is committed to its use in the drafting program and efforts are being made to expand its use to other facilities.


REMEDIATION
PERFORMANCE PRE/POST TEST
TEST/ INSTRUCTION
ENOB OBJ 1 INSTRUCTION
ACAD-CBT MAIN MENU
ENOB OBJ 2 INSTRUCTION
PRACTICE/ REVIEW
PRACTICE TEST
REMEDIATE/ TEST
PRACTICE/ REVIEW
PRACTICE TEST
REMEDIATE/ TEST

Recommended CAD Equipment Configuration

(Hardware and Software)

Hardware:

(1) IBM-AT Microcomputer (80286, or compatible)
(2) Math Co-processor Board (80287)
(3) 1.2 Megabyte Disk Drive w/controller
(4) 20 Megabyte Hard Disk Drive w/controller
(5) 8 Megahertz Clock (or higher speed)
(6) 640K RAM (random access memory)
(7) Digitizer Pad, with stylus or mouse
(8) High Resolution Color Monitor
(9) Enhanced Graphics Board (EGA or equivalent)
(10) Graphics Printer (compatible with CAD software driver)
(11) AT-style keyboard (full ASCII w/numeric pad)

Software:

(1) Autocad Version 2.5 (or higher)
(2) MS/DOS operating system software Version 3.0 (or higher)

Options:

(1) A 360K floppy-disk drive may be substituted for the 1.2 Megabyte drive.

(2) The student version of the Autocad software is recommended for instructional delivery, the full system software for instructional development.

(3) A plotter is normally used for drawing output, but is not required for instruction delivered with the CBT system.

(4) The CBT system will function with a 640K RAM capacity; however, 1024K RAM should be considered for future use.

INSTRUCTORS GUIDE TO THE OPERATION OF ACAD-CBT SOFTWARE

ACAD-CBT

WARNING: The ACAD-CBT program files are located on two 1.2 disks. If you have a 360 disk drive they will not be read!

We recommend a revised AUTOEXEC.BAT file in the MS.DOS root directory. Please be sure to copy the revised version from one of the CBT disks to the root directory containing the original AUTOEXEC.BAT file. This will change the LISPHEAP and LISPSTACK when your computer boots up to allow the ACAD-CBT program to run correctly. After copying the new file, restart your system. The new file will also change your prompt to indicate the current directory.

```
Example: AUTOEXEC.BAT
         echo off
         Prompt=$p$g
         Date
         Time
         set lispstack=5000
         set lispheap=40000
```

Note: The CBT.BAT file also contains thes "set" commands.

After booting the system, change to the AutoCAD subdirectory. Copy the following files from the CBT Part I disk into the ACAD subdirectory. STUDENT.CBT, *.LSP, CBT.BAT, CBT.SCR, and CBTEX.SCR. Type the letters CBT, respond to the prompts, and the program should run automatically. Copy all other files to the directory containing the AutoCAD program files if the system does not do so automatically.

> If not, contact Mardelle Sauer 817-799-3611 Ex. 3208,
> or write to me. TSTI 3801 College Dr. Waco, Tx. 76705
> Please document your proceedure carefully before calling.

1. Copy all files LISTED ABOVE for the CBT Unit of Instruction from sample disks into the hard disk subdirectory containing the AutoCAD (2.5X) program files.

```
---------------------------------------------------------------
    Example:  C:\ACAD> Copy a:*.LSP
---------------------------------------------------------------
```

2. Copy the file named "STUDENT.CBT" from the hard disk to a new formatted floopy disk on A: drive and set aside.

```
---------------------------------------------------------------
    Example:  Copy STUDENT.CBT a:
---------------------------------------------------------------
```

3. Insert the CBT PART 1 disk in A: drive and type the letters "CBT" to initiate the CBT program.

Example: CBT

---

4. Insert the disk containing the STUDENT.CBT file into the A: drive when prompted from the text.

Example:

"Insert STUDENT floppy into A: drive."

---

5. Press any key to enter the CBT system and begin the Unit of Instruction when prompted from the text.

Example:

"Press Ctrl-C to stop, any other key to enter the CBT system."

---

6. Read the instructions from the CBT.sld "CBT Pilot Program" to preview the command sequence necessary to proceed through the Unit of Instruction. You may select TEST to pre-test without remediation before you access the INSTRUCTION.

7. To "Select" a command from the menu use the cursor control keys to highlight the command and then press the Enter key.

8. Follow the instructions stated on each display to view all slides in the instruction.

Examples:

a. "Press the *Enter* key to continue"

Returns to the former display.

b. "Select *MORE* to continue and press the Enter key"

Displays "Primary" slide pages designated with a Page number.

c. "Select *MORE INFO* or *NEXT* to continue and press the Enter key"

MORE INFO displays "Supplementary" slide pages designated with a letter after the Page number.

---

9. Select "Help" from the ACAD-CBT menu to display the CBTmain.sld and view a summary "HELP".

10. Select "TEST" to pre-test or "Instr." from the ACAD-CBT menu to begin the presentation of the *.dwg files contained in the TEST or *.sld files contained in the "Object 1" "Instruction" portion of the program.

NOTE: There will be a delay. Do NOT reselect or type any characters. The CBT program may interpret any entry as "QUIT"!

11. Select the answers from the menu or on the graphics display to respond to the TEST questions. After completing the 20 questions the display will return to the Main Menu and you may begin the INSTRUCTION for Object 1.

or: Select "Help" from the ACAD-CBT Instruction menu to display the CBThelp.sld and view a summary "USING THE CBT INSTRUCTION PROGRAM".

12. Continue to view all Primary and Supplementary slides to complete the "Instruction" portion of the program through Page 13.

13. Select "Previous" to review previously viewed slides OR select "SLIDE" and type the number of the desired slide to review any page at random.

14. After completing the Instruction select "Practice" to begin viewing the *.dwg files in the "Practice Test" portion of the program.

NOTE: There will be a delay. Do NOT reselect or type any characters. The CBT program may interpret any entry as "QUIT"!

15. Select the answer for each question displayed by highlighting the menu or by using the cursor to select from the graphics display as directed in the menu.

NOTE: Each drawing file will display a custom menu appropriate to the inserted drawing file being viewed.

16. Continue to select as prompted until the correct answer is identified and recorded. The display will automatically move to the next file.

NOTE: The number of incorrect selections is not limited!

NOTE: Incorrect selections will be prompted:
"Wrong, try again." or "Nothing near select point, try again."

NOTE: Correct selections will be prompted: "Correct"

17. When the "Practice Test" presentation is completed the Prompt will display a summary containing a Test score of 100% and the efficiency of the user.

```
-----------------------------------------------------------------
    Example:
    "You have completed the entire test!"
    Scoring: 100.0% <Out of 9 questions, you gave 10 answers.>
    Efficiency rating: 0.9000
    You passed the test, very good.
    What would you like to do?
-----------------------------------------------------------------
```

18. To review the scoring prompt press the F1 function key. The graphics display will change to a text display with the most recent Prompt messages.

19. Press the F1 function key to return to the graphics display.
NOTE: If the menu fails to redisplay press the F2 function key.

20. Select "NEXT" from the ACAD-CBT Menu, IF it does not change automatically, to continue and update the menu to "Object2".

NOTE: If the menu fails to change to "Object2" select "Next".

21. Select "Instr." from the "Object2" menu and continue the "Instruction" and "Practice" as described (10. - 20.) above.

NOTE: Objectives 3 and 4 are located on the second disk. Follow the proceedure above (2 - 5) to enter the files onto the hard disk and complete the remaining two Objectives.

22. Select "Test" from the ACAD-CBT menu to begin the "Performance Test" sequence of the presentation.

NOTE: There will be a delay. Do NOT reselect or type any characters. The CBT program may interpret any entry as "QUIT"!

23. Continue as in the "Practice Test" to select as prompted until the correct answer is identified and recorded. The display will automatically regenerate with the correct selection identified and then move to the next file.

NOTE: The "Performance Test" will allow only THREE incorrect responses before regenerating and proceeding to the next display.

24. When the "Performance Test" presentation is completed the Prompt will display a summary containing a Test score of X% and the efficiency of the user.

```
----------------------------------------------------------------
    Example:
    "You have completed the entire test!"
    Scoring: 100.0% <Out of 9 questions, you gave 10 answers.>
    Efficiency rating: 0.9000
    You passed the test, very good.
    What would you like to do?
----------------------------------------------------------------
```

25. There will be a presentation of remedial displays based on incorrect or "Skipped" Test questions available at the end of the Test.

26. Press the F1 function key to return to the graphics display.
NOTE: If the menu fails to redisplay press the F2 function key.

27. Select "Quit" from the menu to return to the "ACAD-CBT" menu and select "Quit" again to exit to the CBT.bat file.

28. The CBT.bat file will automatically record the time, date, elapsed time, and scores on the appropriate files resident on the hard disk. It will also update the Student.cbt file on the A: drive.

```
----------------------------------------------------------------
    Example:  1 File (s) copied
              Master.bak
              Datetime.cbt
              1 File (s) copied
----------------------------------------------------------------
```

29. To exit the CBT program you must respond to the prompt with the Control key and letter C pressed in unison and type the letter "Y".

```
----------------------------------------------------------------
    Example:
 "Press Ctrl-C to stop, any other key to enter the CBT system."

    Prompt:  Terminate batch job (Y/N)?
    NOTE:  Type Y
    NOTE:  (OR) You may re-enter the CBT program at this time.
----------------------------------------------------------------
```

30. Read the "Datetime.cbt" file to view the updated information regarding the most recent user of the CBT Unit of Instruction.

```
-----------------------------------------------------------------
    Example:  Type: Type Datetime.cbt
BETA TEST FILE 2     TESTING1 07/23/87 12:54:54
12:55:20 12:56:02 0.702 min. INST OBJECT3
12:56:03 13:00:05 4.038 min. PRTC QUIZ3 13 tries with 77%
 Eff.Rtng: 0.6923
13:00:34 13:02:00 1.435 min. INST OBJECT4
13:02:01 13:04:56 2.921 min. PRTC QUIZ4 9 tries with 66%
 Eff.Rtng: 1.0000
13:05:07 13:12:12 7.098 min. TEST TEST 23 tries with 75%
 Eff.Rtng: 0.8696
-----------------------------------------------------------------
```

31. Read the "Master.cbt" or "Master.bak" files to review the complete record of all access to the Unit of Instruction.

```
------------------------------------------------------------------
    Example: Type: Type Master.bak
BETA TEST FILE 2     TESTING1 07/23/87 09:32:11
09:33:15 09:37:53 4.619 min. INST OBJECT3
09:37:53 09:42:36 4.717 min. PRTC QUIZ3 20 tries with 100%
 Eff.Rtng: 0.4500
09:43:34 09:49:15 5.686 min. INST OBJECT4
09:49:15 09:53:03 3.802 min. PRTC QUIZ4 14 tries with 100%
 Eff.Rtng: 0.6429
09:53:14 10:01:26 8.206 min. TEST TEST 28 tries with 95%
 Eff.Rtng: 0.7143
------------------------------------------------------------------------------
```

32. Re-enter the CBT system on a continuous basis by typing CBT from the ACAD prompt or from within the CBT.BAT file.

33. Student files may be made with the name of each student that will use the CBT program to accurately record the relavent data for each named individual.

Note: Edlin or a word processing program in "Nondocument" mode may be used for this purpose.

```
-------------------------------------------------------------------
Example:
File name:  STUDENT.CBT
File content: Student's name      File name, Test Level and Class
                                  (beginning on the 21st space)

    Example:  Mardelle Sauer      TESTING 2 0
                                  ^
              1234 etc.           21
```

Note: The Test Level number denotes the location of the line containing the "******** TEST 3 85" in the file named "TESTING". Begin counting 0,1,2 etc.

```
Example: Testing.cbt
         OBJECT1 QUIZ1 0 100
         OBJECT2 QUIZ2 0 100
         ******** TEST 3 85
```

Note: The TEST file will serve as a pre-test without remediation and the comprehensive test with remediation. The line designated with the letter "I" must be a slide file for that purpose.

```
------------------------------------------------------------------
Example:
         Q T20
         M Select¦The¦Missing¦Line
         A (13.2250 2.2500)
         R MOVE 13.25,3.5  13.25,3.5 3.0,6.0
         I O4P6     =    (file O4P6.SLD)
-------------------------------------------------------------------
```

34. Hard copies of the *.CBT, MASTER.CBT and other files may be printed for reference and evaluation purposes.

```
-------------------------------------------------------------------
    Example:  Press: Ctrl-P
              Type: Type Filename.cbt
-------------------------------------------------------------------
```

35. Students should be directed to take note of their scores as they appear at the end of each "Practice" and "Test".

AutoCAD Computer Based Training

Programmer's Reference Information

Author: Bill Kramer

For:
Texas State Technical Institute
Design and drafting department

May 1987

Table of Contents

Introduction 2

1 AutoLISP Functions & Usage 3

2 Variables Used by the system 5

3 System File Formats 8

4 Setting up the system 11

5 Tracking student activities 13

6 Teacher Utilities 14

Listings of CBT AutoLISP, Batch & Script Code

Introduction

This manual is intended for programmers of the AutoCAD CBT system. Courses are programmed by building a set of text files that detail the instructional slide sequence and testing controls. In order to understand the contents of the following sections, a working knowledge of MS-DOS and the AutoCAD system are expected as well as a basic understanding of the AutoLISP languages and programming practices.

In order to program new instructional sequences and testing controls into the CBT system, a text editor is required. There are many good text editors (and word processors that manipulate ASCII text files) available in addition to the EDLIN program provided with most MS-DOS systems. This document assumes that the reader has access to some text editor and the knowledge of how to use it to manipulate the required text files.

Section	Contents
1	AutoLISP Functions & Usage. Explanation of the AutoLISP functions defined in the CBT system and their basic application.
2	Variables Used by the system. A listing of the variables used by the CBT programs. This information is intended primarily for those programmers wishing to further enhance the CBT system.
3	System file formats. A description of the various data files used by the CBT software. The data files are programmed by instructors placing instructional and testing information into the CBT system.
4	System Setup. The placement of system files for the installation of a CBT system.
5	Student information tracking. Student performance tracking system operational outline.
6	Teacher utilities are AutoLISP macros intended to make the development of classes easier and installation more accurate.

1. AutoLISP Functions & Usage

This section explains the basic CBT LISP modules and how they interact with the system. A more thorough explanation of the internal workings may be found in the comments provided within the source listings of the LISP programs and file formats which they work with.

C:CBT Primary entry to system. Controls sequence through classes working with the STUDENT and UNIT-Class files. Controls entries to all other LISP functions. Before starting the CBT program, all CBT functions must be loaded. The virtual memory may be activated before CBT is loaded however, CBT.LSP will activate it while entering into the system. To start CBT once all the CBT LISP files have been loaded, type CBT and press the return key.

CBTINS Instructional guidance controls. Moves student through enabling object/unit of instructional slides. Options to see more information, if available and to move forward or backward through the slide sequence. CBTINS is entered via the CBT main command function with one parameter, the file name of the instructional sequence control list file.

CBTTST Testing control function. Reads the test controls from the TEST file, either associated practice test or performance test for unit. The class control list with testing parameters is passed from the CBT main command program. Test options, which are loaded from the testing control file, include Menu selections, entity selections (based on primary point) and command responses to answers. Test performance is graded on a straight Pass/No Pass percentage calculated by taking the number of correct answers, dividing by number of possible correct answers and multiplying by 100.

CBTREPT Report on files used by CBT class. Produces a file named FILES.CBT which shows all of the files related to a specified class. If a file is not on the system, a message is generated saying that the file is missing.

AutoLISP Functions and Usage (cont)

CBTLRN1 Program CBT with information about a test or quiz by showing the answer, generating the screen menu interactively along with AutoCAD responses.

MENUDISP Output a list of strings to the AutoCAD menu and text display areas. Contained in file CBT.LSP.

`(menudisp (list "" "" "One" "Two" "Three"))` displays blanks in the mode and coordinates area and the three strings starting with the first box on the menu. Each individual text item is displayed in a separate box. The first two items in the list are displayed in the coordinates and mode areas respectively.

PARSE Given a line of text and a variable delimiter, parse the items into a list. Parse is in the file CBT.LSP.

```
(setq LText "One Two Three Four")
(parse LText " ")  returns ("One" "Two" "Three" "Four")
```

TIMER Records the time information for instructional and testing sequences. The data is written to the DATETIME.CBT file (handle TLFH). Timer is in the file CBT.LSP.

AutoLISP Files & Functions

CBT.LSP	MENUDISP PARSE TIMER *ERROR* C:CBT
CBTINS.LSP	CBTINS
CBTTST.LSP	CBTTST
CBTREPT.LSP	CBTREPT
CBTLRN1.LSP	CBTLRN1

2. Variables Used by the system.

The following table is a list of the variables used by the CBT AutoLISP software. This information is provided for programmers attempting to modify, improve or just understand the technics employed. The list is sorted alphabetically by variable name. Local binding is called out if applicable in all instances of the variable.

Answ	Answer flag, non-nil if correct answer is given in testing module.
Bname	Block name, used for loading test information.
Box	Box number for text output in MENUDISP.
Cexit	Flag for internal CBT loop. Equals nil to keep on looping. Value is tested at higher levels for grading and performance evaluation.
Clseq	Class sequence list, from unit control file.

```
(
 (<Unit-Enabobj control file name>
  <Unit-Enabobj practice test control file name>
  <Number of tries/question>
  <Percentage required to pass>)
 ...)
```

Clss	Integer instructional level.
CNT	Integer counter/index used in local loops.
CR	Flag to wait for input loop termination.
Dlm	Delimiter for PARSE string function.
Ecnt	Counter for index into selection set when looking for matching entity.
Elist	Entity list accessed through selection set.
Fini	Flag for primary CBT loop. Equals nil to keep on looping. Set to non-nil to exit.
FP	General purpose file pointer.
Grade	Integer, nil if no grading or class advancement is to be performed. Has a value otherwise.
Ilst	Remedial instruction list used by CBTTST.

Variables Used by the system.

Inlist	Control list for instructional sequence.

```
(
 (<Type: Primary or Secondary>
  <Slide name>)
 ...)
```

Item	Local variable used in FOREACH & MAPCAR.
LL	Local variable, used for counter/index.
MenuL	Text for menu output, used by F2 recovery.
Menulist	List of strings for the current menu to display.
Mlist	Menu list, used for loading test information and for F2 menu recovery in CBT & CBTINS.
NCA	Number of correct answers.
PCA	Percent correct answers.
Ptest	Integer performance test level.
Q-Cnt	Integer count of the number of answers attempted by the student.
Q-list	Control list for testing sequence.

```
(
 (<type>   Type is "M" menu or "S" selection
  <block name>  Block name to insert
  (<Menu display list>)
  <answer> | (<Point list if type is "S">)
  (<AutoCAD command response list>)
 )
 ...)
```

Q-Lvl	Integer pointer to the current level of the questions in the testing module.
Q-Old	Integer pointer to last question, for single loop control of error situations (by passes screen regeneration when bad input made).
Q-Res	Responses list, used for loading test information.
Q-typ	Question type, used for loading test information.
S1	Selection set used for object searching in graphic database.

Variables Used by the system.

S	Error string for reporting exit condition in CBT.
SEQNAM	Instructional Sequence name bound to CBTINS.
STP	Stop time in Julian days, local to TIMER.
Strt	Start time in Julian days.
Studt	Student control information list. (<Name of Student> <Unit control file name> <Current level of performance testing> <Current level of instruction>)
Temp	Temporary variable.
T-DATA	Bound to CBTTST, ClSeq data list.
TDSt	Time date of start of session (inst, prtc, test).
TLFH	File handle for time log file.
TNA	Total number of answers attempted.
TT	Temporary variable, used primarily in GRREAD Input statements.

3. System File Formats

Student Control File: Maintained on floppy disk, copied to hard disk before CBT session is started. Fixed name of "STUDENT.CBT"

```
Student Name      <Unit File name> <Test level> <Class level>

                  Column 21        Space        Space
```

Unit Control File: Copied from class diskette. Contains the Enabling objective and test control information for the class the student is currently enrolled in. The Unit control file name is based on value in the STUDENT.CBT file. The .CBT file extension is automatically appended to the file name provided in the STUDENT.CBT file when the Unit control file is accessed.

Each line contains an Enabling objective level which consists of an Enabling object control file name, a practice test control file name and some test control data. The data is arranged in normal ASCII text lines with each item separated by one space as follows.

```
<Enab-Obj> <Test> <# Tries/answer> <Passing %>
```

Performance tests are differentiated from practice tests at the Unit Control level. A performance test name is defined whenever the Enabling objective file name entry is "********". The number of tries/answer and passing % may be used for both performance and practice tests.

Time Recording File: A new time & date recording file is built for each session the student uses the system. The time and date information is stored in a file named DATETIME.CBT which is created each time CBT is started, all previous data in the DATETIME.CBT file is erased. In order to save the information, follow the procedures outlined in the section "Tracking Student Activities". The format for the time tracking file is quite simple, the first line contains the name of the student, the date and time when the system was activated and what class the student is taking. The remaining lines contain individual activity tracking. The start, stop time and elapsed minutes of the activity, the name of the unit of instruction or test and for tests, the number of answers attempted with the percentage of correct answers.

System File Formats

Enabling Objective Control File: The Enab Obj control file contains a list of AutoCAD slide names arranged in the order of the class. There are two types of slides in the CBT system, primary and secondary. The primary slides are always accessed from the CBT instructional menu with the NEXT selection. Secondary slides (if any are defined) are accessed only when the MORE option is selected.

The slides are arranged by lines with the first character of each line being either a P or S character for primary slide or secondary slide. There may be none or many secondary slides for each primary slide. There must be at least one primary slide as the very first line of the file.

```
P <primary slide name>
S <secondary slide name>
```

Space between P or S and slide name.

Testing Control File: The test control file is the most complex file of the ACAD CBT system. Each question within a test consists of several different lines of information which vary depending on the type of answer to be expected and the AutoCAD interaction desired.

Test control files for both practice and performance sessions are constructed in the same manner. In that way, portions of tests may be easily extracted and rearranged within the practice and performance tests for a subject.

Each line of the test control file starts with a control character followed by a blank. The control character is one of the following:

Q	Start a new question block.
M	List of items to display on the screen menu.
A	Answer
R	AutoCAD script response before next question.
I	Related remedial instructional slides.

There is only one Q and one A line for each question. There may be any number of M, R and I lines for each question.

System File Formats

Test Control Files (cont)

The data following the control character depends on the control character's value.

Question block start: AutoCAD Drawing Name to insert.

Menu List: Set of strings to display on the screen menu separated by the vertical bar symbol "|".

Answer: If first character is parentheses open "(", the answer is a point on the screen that corresponds to the primary location of an entity within the block inserted for the question. (block is inserted at 0,0) If the first character is not "(", the answer is a string which may be answered by selecting the matching item on the screen or typing in the answer.

Response list: List of AutoCAD commands (optional) to be executed before moving on to the next question in the series. Each command is separated by a blank space. To force a return (as in exiting the LAYER command), use a semicolon or null space. For example, the two following response lines will accomplish the same results.

```
R LAYER NEW 1 ; LINE 0,0 1,1 ; ARC 1,1 1.5,.75 2,0
R LAYER NEW 1  LINE 0,0 1,1  ARC 1,1 1.5,.75 2,0
```

As an example test block, below are the lines for a question that uses block "TESTQ1" with menu entries of "Select the item from the screen" and answer (1.00 2.00). When the question is completed, the layer "1" is to be thawed.

```
Q TESTQ1
M Select|the item|  from|   the|screen
A (1.00 2.00)
R LAYER THAW 1 ;
```

4. Setting up the system

The guide lines presented below are the recommended set up procedures to follow when preparing a computer to use the CBT software. These are only guidelines and may be changed by the person(s) responsible for each site depending on the number of CBT classes and the amount of disk space required. CBT files may be maintained on either the hard disk or the floppy. The installation and set up information provided is for a system to be used with multiple classes and students.

Installing the CBT Programs

Place the CBT AutoLISP, DOS Batch and AutoCAD Script files on the hard disk in the same directory as AutoCAD.

The following files should be on your hard disk.

CBT.LSP	Primary LISP control programs.
CBTINS.LSP	Instructional LISP program.
CBTTST.LSP	Test administration LISP program.
CBT.BAT	CBT startup from DOS.
CBT.SCR	CBT startup for AutoCAD, loads LISP files and starts CBT.
CBTEX.SCR	Exit the AutoCAD system to DOS script.
CBT.DWG	Initial drawing for class.
CBTHELP.SLD	Help slide for use in instructional section.
CBTMAIN.SLD	Help slide for use in main program.
CBT.SLD	Drawing for class after an instructional sequence or test sequence.
STUDENT.CBT	Student name and class information.

The following files may be located on the hard disk when the CBT system is active. They may be moved from the diskette to the hard disk before initiating the AutoCAD CBT LISP programs.

STUDENT.CBT	Student name and class information.
CBT.SLD	Class slide for main menu view.
CBT.DWG	Initial class slide for main menu.
CBTHELP.SLD	Help slide for instructional level.
CBTMAIN.SLD	Help slide for main menu level.

Setting up the system (cont)

The remaining files are named based on the contents of other files. For example, the class file is named in the STUDENT.CBT file after the student name. The class file as well as the instructional sequence and testing control files all have the file extension CBT.

```
                             STUDENT.CBT
                                  |
                             <Class>.CBT
                              //     \\
                             //       \\
<Instructional Sequences>.CBT      <Testing controls>.CBT
         ||                                  ||
<Slides>.SLD                           <Figures>.DWG
```

(Single line <|> represents a one to one relationship, double bar <||> represents a one to many relationship.)

The CBT files and associated slides and drawings may be stored anywhere, including in different subdirectories or on different drives. Classes that are maintained on the floppies that grow too large may select to use more than one floppy drive or to offload some of the drawings and slides to directories on the hard disk. Where ever the CBT files are, the entries in the parent file should reflect the information.

For example, the description of a file on the A: drive would begin with the characters "A:", then the file name. File extensions are not required, since CBT will append the appropriate extension when the file is used.

Example Configuration for CBT on a Hard Disk

```
\ACAD
<...AutoCAD files...>
CBT.BAT       CBT.DWG       CBT.SCR     CBTEX.SCR
CBT.LSP       CBTINS.LSP    CBTTST.LSP  CBTMAIN.SLD
CBTHELP.SLD   CBT.SLD
```

Copy from student floppy: (Student and Timelog will be copied back to the floppy when the work session is completed.)

```
STUDENT.CBT   TIMELOG.CBT    *.CBT
```

Leave the class slides and drawings on the floppy drive(s).

```
*.SLD         *.DWG
```

5. Tracking Student Activities

The CBT system has a stop watch built into the system that builds a new session file every time the CBT program is started. To properly build the session time log file, CBT must be started and exited using the methods provided within the system.

Each time CBT is started, a file named DATETIME.CBT is created on the hard disk. This file may be merged with other time and date files using the batch control file CBT.BAT to create a complete time tracking collection system.

The file DATETIME.CBT contains two types of data lines. The first line of the file (the header record) is made up of the name of the operator, the class name, the date and time started into the system. Each of the subsequent lines contains the information for a session. A session is recorded each time an instructional sequence or a test is completed. The start time, ending time and elapsed minutes are recorded as well as the unit of instruction or testing name. The results of any testing are also posted giving the number of answers entered and the percentage correctly answered.

To create a master timelog for the hard drive, which records all activity of the CBT system, the following DOS commands must be added to the CBT.BAT program.

```
ERASE MASTER.BAK
RENAME MASTER.CBT MASTER.BAK
COPY MASTER.BAK+DATETIME.CBT MASTER.CBT
```

These commands are to be added after the AutoCAD command line: ACAD CBT CBT.

A student master time tracking may take place on the floppy drive. It is a good idea to run a duplicate time log in case there is a dispute or the one of the disks has problems. The student copy is maintained using the DOS commands given below. Add them after the commands for the hard disk time tracking.

```
COPY A:MASTER.CBT
ERASE A:MASTER.CBT
COPY MASTER.CBT+DATETIME.CBT A:
```

The STUDENT.CBT file should also be copied to the floppy which is then returned immediately to the computer room administrator.

6. Teacher Utilities

The programming of a CBT class requires the set up of several coordinated AutoCAD and text files. Most of the problems encountered when preparing a CBT class are related to the "book keeping" of all the associated files. The second most frequent problem is the creation of test sequences since these files are somewhat "free format". Two utility programs are presented to help the teacher get past these problem areas: CBTREPT and CBTLRN1.

CBTREPT

CBTREPT generates a report detailing all of the files used in a CBT class. To operate CBTREPT first enter the AutoCAD drawing editor [new or existing drawing, makes no difference]. Next load and execute the CBTREPT macro file by typing the following:

```
Command: (load "CBTREPT")
C:CBTREPT
Command: CBTREPT
CBT Report.  Results output to FILES.CBT
Class file name <.CBT>: _
```

Enter the name of the CBT class for which you wish to have a report generated. The file FILES.CBT is automatically created [or written over] and may be viewed using the DOS TYPE command or or a text editor. FILES.CBT may also be printed using the DOS PRINT command.

Classes are reported by showing each Instructional sequence and Quiz contents. The file names referenced in the CBT control files are also checked to see if they are on the system.

CBTREPT should only be run when preparing or installing a CBT system to check for the existence of files. Once a system is operational, it should only be used for error checking of the operational system. It is recommended that CBTREPT be removed from systems that students are using since the answers to quizes and tests are also printed.

Teacher Utilities (cont)

CBTLRN1

CBTLRN1 is a macro command that will build a testing sequence control file from interactive entry by a teacher in AutoCAD. To use CBTLRN1 it must first be loaded into the AutoCAD drawing editor. Enter the following sequence to load and start CBTLRN1.

```
Command: (load "CBTLRN1")
C:CBTLRN1
Command: CBTLRN1
CBT Learn 1  Test Building
Enter test file name:
```

The test file name is the name of the file to be used in the class sequence. If the file already exists it will be overwritten creating a new file. Do not enter the file extension as it is added automatically be CBTLRN1.

Once a file name has been entered, the AutoCAD screen is cleared and a figure name requested. Enter DIR to display all of the *.DWG files in the current directory if you cannot remember a file's name.

Entry of an existing file to CBTLRN1 will result in the figure being inserted for display.

Entry of a nonexisting file will result in the prompt for a figure name to be repeated. Press the RETURN key with no input data on the line to leave CBTLRN1.

After the file is loaded onto the display, the menu items are requested. Type each line as you would like to see it displayed on the screen menu for that question. Press return to complete an entry. Remember that you are limited to eight characters for display on one line in the AutoCAD screen menu. To leave a blank entry followed by more text entries, press the space bar once then RETURN. To leave the menu definition press RETURN with no data on the Menu Item: prompt line.

Teacher Utilities (cont)

Next CBTLRN1 wants to know what type of answer is expected. There are currently two types of question-answer pairs supported in CBT, Data typed from the keyboard [or selected from the screen menu] and the selection of an Object using the pointing device or cursor keys. The default answer is Object, press RETURN to select an object from the figure to serve as an answer. The objects control point is selected by CBTLRN1. Otherwise enter "D" followed by RETURN to then enter data as an answer. Remember that answer data is case sensitive. In other words, the answers "MARS" and "Mars" are not the same.

After the answer information, the AutoCAD command response list is requested. Type AutoCAD commands and data directly to CBTLRN1. ";" may be used to force a return in the middle of a sequence of AutoCAD commands. Press RETURN to exit the response list building portion of CBTLRN1.

Finally the related CBT slides for this problem are requested. Enter the names of any slides that may be used as remedial study if the question is not answered properly. Press RETURN to exit the list building.

The figure and menu area are then erased and the next figure is requested. The process is repeated until a figure name is not entered.

CBTLRN1 generates the file after all of the sequence information has been entered. If you wish to append to an existing file, a text editor must be used to merge the two together.

autoexec.bat

```
echo off
Prompt=$p$g
Date
Time
set lispstack=5000
set lispheap=40000
```

cbt.scr

```
2 CBT
(load "CBT")
(load "CBTINS")
(load "CBTTST")
cbt
```

testing.cbt

```
OBJECT1 QUIZ1 0 100
OBJECT2 QUIZ2 0 100
******** TEST 3 85
```

testing1.cbt

```
OBJECT3 QUIZ3 0 100
OBJECT4 QUIZ4 0 100
******** TEST 3 85
```

cbtex.scr

```
QUIT Y 0
```

student.cbt

```
BETA TEST FILE 1    TESTING 2 0
```

student.cbt

```
BETA TEST FILE 2   TESTING1 2 0
```

object1.cbt

```
P I1
S I1a
S I1b
S I1c
P I2
S I2a
S I2b
S I2c
P I3
P I4
P I5
P I6
P I7
S I7a
S I7b
P I8
P I9
P I10
S I10a
S I10b
P I11
S I11a
S I11b
P I12
S I12a
S I12b
P I13
```

quiz1.cbt

```
Q P1
M 1¦2
A 1
Q P2
M 1¦2
A 2
Q P3
M 1¦2¦3
A 1
Q P4
M 1¦2¦3
A 1
Q P5
M Select¦The¦Number
A (8.7594 1.7095)
Q P6
M Select¦The¦Number
A (8.7500 4.9744)
Q P7
M Select¦The¦Number
A (11.7500 1.7244)
Q P8
M Select¦The¦Number
A (10.4120 3.2690)
Q P9
M Select¦The¦Number
A (11.4128 4.8232)
Q P10
M Select¦The¦Number
A (8.6460 4.9744)
```

object2.cbt

```
P O2I1
P O2I2
P O2I3
P O2I4
S O2I4a
S O2I4b
S O2I4c
P O2I5
S O2I5a
S O2I5b
P O2I6
S O2I6a
S O2I6b
P O2I7
S O2I7a
S O2I7b
P O2I8
```

quiz2.cbt

```
Q O2P1
M HIDDEN¦CENTER¦OBJECT
A OBJECT
Q O2P2
M HIDDEN¦CENTER¦OBJECT
A CENTER
Q O2P3
M HIDDEN¦CENTER¦OBJECT
A HIDDEN
Q O2P4
M Select¦The¦Example
A (2.25 1.75)
Q O2P5
M Select¦The¦Example
A (3.50 6.25)
Q O2P6
M Select¦The¦Example
A (11.25 4.25)
```

student.cbt

```
BETA TEST FILE 2    TESTING1 2 0
```

object3.cbt

```
P 03I1
P 03I2
P 03I3
P 03I4
S 03I4A
S 03I4B
S 03I4C
P 03I5
S 03I5A
S 03I5B
S 03I5C
S 03I5D
P 03I6
S 03I6A
S 03I6B
S 03I6C
S 03I6D
P 03I7
S 03I7A
S 03I7B
S 03I7C
```

quiz3.cbt

```
Q 03P1
M 1¦2¦3
A 2
Q 03P2
M 1¦2¦3
A 3
Q 03P3
M A¦B¦C¦D¦E¦F¦G¦H
A E
Q 03P4
M Select¦From¦The¦Screen
A (3.1196 5.6147)
Q 03P5
M 1¦2¦3
A 2
Q 03P6
M 1¦2¦3
A 2
Q 03P7
M 1¦2¦3
A 3
Q 03P8
M 1¦2¦3
A 2
Q 03P9
M 1¦2¦3
A 1
```

object4.cbt

```
P O4I1
P O4I2
P O4I3
P O4I4
S O4I4A
S O4I4B
S O4I4C
P O4I5
S O4I5A
S O4I5B
S O4I5C
S O4I5D
P O4I6
P O4I7
S O4I7A
P O4I8
S O4I8A
P O4I9
S O4I9A
P O4I10
S O4I10A
P O4I11
S O4I11A
P O4I12
S O4I12A
```

quiz4.cbt

```
Q O4p1
M Select¦The¦Missing¦Line
A (11.0000 2.2500)
Q O4P2
M Select¦The¦Missing¦Line
A (11.0000 2.2500)
Q O4P3
M Select¦The¦Missing¦Line
A (12.5000 2.2500)
Q O4P4
M Select¦The¦Missing¦Line
A (11.7500 2.2500)
Q O4P5
M Select¦The¦Missing¦Line
A (12.5000 2.2500)
Q O4P6
M Select¦The¦Missing¦Line
A (12.5000 2.2500)
Q O4P7
M Select¦The¦Missing¦Line
A (11.7500 2.2500)
Q O4P8
M Select¦The¦Missing¦Line
A (12.5000 2.2500)
Q O4P9
M Select¦The¦Missing¦Line
A (9.5000 2.2500)
```

test.cbt

```
Q T1
M Select¦The¦Number
A (6.5581 5.6243)
R LAYER THAW ANST1 ;
I I7A
Q T2
M Select¦The¦Number
A (5.5493 3.6594)
R LAYER THAW ANST2 ;
I I7A
Q T3
M Select¦The¦Number
A (7.5845 3.6594)
R LAYER THAW 2B ;
I I7A
Q T4
M Select¦The¦Number
A (5.7375 4.4686)
R LAYER THAW 2C ;
I I11A
Q T5
M Select¦The¦Number
A (5.7375 1.2186)
R LAYER THAW 2D ;
I I11A
Q T6
M Select¦The¦Number
A (8.7375 1.2186)
R LAYER THAW 2E ;
I I10B
I I11A
Q T7
M Select¦The¦Number
A (8.2500 5.7500)
R LAYER THAW 2F ;
I I13
Q T8
M Select¦The¦Number
A (7.1620 2.7690)
R LAYER THAW 2G ;
I I13
Q T9
M Select¦The¦Number
A (5.3960 4.4744)
R LAYER THAW 2H ;
I I13
Q T10
M 1¦2¦3¦4¦5¦6
A 2
R LAYER THAW ANST10 ;
I O2I5
I O2I5A
Q T11
M 1¦2¦3¦4¦5¦6
A 5
R LAYER THAW ANS2 ;
I O2I7
I O2I7A
Q T12
M 1¦2¦3¦4¦5¦6
A 3
R LAYER THAW ANS3 ;
I O2I6
I O2I6A
I O2I6B
I O2I8
Q T13
M 1¦2¦3
A 1
R LAYER THAW ANS4 ;
I O2I4
I O2I4A
Q T14
M 1¦2¦3
A 2
R LAYER THAW ANS5 ;
I O2I7
I O2I7A
Q T15
M Select¦From¦The¦Screen
A (9.0000 1.5000)
R TEXT 9.75,1.75 .25 0 Side
I O3I6A
Q T16
M Select¦From¦The¦Screen
A (9.0000 4.0000)
R INSERT TOP 10.0,3.75 ; ;
I O3I6C
Q T17
M Select¦From¦The¦Screen
A (9.5000 1.5000)
R TEXT 11.0,1.25 .25 0 Front
I O3P7
Q T18
M Select¦The¦Missing¦Line
A (11.2500 3.2500)
R MOVE 11.25,3.25 ; ; 11.25,3.25 2.0,4.5
I O4P7
Q T19
M Select¦The¦Missing¦Line
A (11.2500 3.0000)
R COPY 11.75,3.0  11.25,3.0 4.0,2.5
I O4I8A
Q T20
M Select¦The¦Missing¦Line
A (13.2250 2.2500)
R MOVE 13.25,3.5  13.25,3.5 3.0,6.0
I O4P6
```

CBT PROGRAM GOALS

The CBT guide is designed at Unit level to support the acquisition of basic drafting skills with eight goals. These goals include:

1. The utilization of Computer Aided Design (C.A.D.) microcomputer workstations to design and present instruction.

2. The utilization of Computer Aided Design (AutoCAD 2.5X) software to design and facilitate the presentation of instruction.

3. The utilization of Artificial Intelligence (AutoLisp) software to provide a flexible shell for the authoring, interactive presentation, and measurement of courseware.

4. The development of an authoring system that requires minimal knowledge of text editing to allow an author to create control files.

5. The elimination of the necessity for any computer programming on the part of the author.

6. The presentation of text and graphic files that allow the student to interact with the program in the selection and identification of entities.

7. The evaluation of skill acquisition and the efficiency of student progress through the automatic creation of retrievable text files containing all relevant data.

8. The flexibility to author instruction in a multitude of subject area including drafting.

BASIC DRAFTING SKILLS

FUNDAMENTAL CONCEPTS:

1. Function of drafting in design and production.
2. Use and care of drafting instruments and materials.
3. Lettering/text.
4. Geometry and construction of drafting drawings.
5. Scales.

CBT UNIT OF INSTRUCTION

6. Alphabet of lines.
7. Pictorial views.
8. Orthographic projection.
9. Dimensioning.
10. Sectional views.
11. Details, assembly drawing and parts list.

ADDITIONAL COMPETENCIES INHERENT TO CAD

INTRODUCTORY CAD - CBT CONCEPTS:

GENERAL INFORMATION

1. Introduction to CAD / CBT hardware and software.
2. Understanding the functions and terminology of CAD and CBT based instruction and drafting.
3. Operation of a CAD workstation and CBT software.
4. Evaluation of skills in performance based instruction.
5. Reference materials, learning guide, and manuals for CAD based instruction.

PERFORMANCE BASED CAD / CBT USER CONCEPTS

1. Keyboard, pointing device, disk and output device familiarization and operating procedures.
2. Theory and practice of MS DOS file and system management.
3. Drafting geometry using the system of X Y coordinates.
4. Computer generated graphics and text file manipulation.
5. Operation of Computer Aided Drafting software to edit and manipulate disk based instruction, and tests in basic drafting.
6. Develop drafting geometry using the AutoCAD software.

NOTE: See "CBT Course Objectives".

UNIT OF INSTRUCTION

The unit of instruction in basic drafting skills is an example of the structure of the CBT program. It seeks to demonstrate the flow of the presentation of instruction, practice testing, and a performance test. The instruction and practice "objective" includes these objectives and tasks.

Note: The sample CBT unit of instruction also includes information about the CBT program for demonstration purposes to instructional personnel that is not intended for students.

SUBJECT: Multiview Projection

TERMINAL OBJECTIVE: Identify and place linetypes on a projection view to correspond with a pictorial drawing.

ENABLING OBJECTIVE I: Given instructions in the operation of a CBT workstation, using the ACAD-CBT program software, the student will access the program from the ACAD directory and use appropriate selections and commands to access and complete a Unit of Instruction.

LEARNING TASKS:

1. Initiate the ACAD-CBT Unit of Instruction from the ACAD directory.
2. Use alphanumeric and cursor control keys to select from the CBT menus or graphics display to access the instructional sequence and tests.
3. Use alphanumeric and cursor control keys to select from the CBT menus or graphics display to complete a Unit of Instruction in orthographic projection.

ENABLING OBJECTIVE II: Given an example of a pictorial drawing and corresponding projection views, the student will identify characteristics of each with 85% accuracy.

LEARNING TASKS:

1. Recognize and identify a pictorial drawing or projection view of the same object.
2. Recognize and identify the front, top and side view of a multiview projection.
3. Recognize and identify the placement of height, width and depth dimensions in a multiview projection.

ENABLING OBJECTIVE III: Given a selection of linetypes, the student will identify each linetype with 85% accuracy.

LEARNING TASKS:

1. Recognize and select the name of each linetype from a list of examples.
2. Recognize and identify each linetype on examples of a multiview projection.

ENABLING OBJECTIVE IV: Given a selection of views, the student will identify the missing projection view with 85% accuracy.

LEARNING TASKS:

1. Recognize and identify the planes of a projection view.
2. Recognize and identify the edges of a projection view.
3. Recognize and identify the correctly drawn projection view from a selection of views to complete a multiview projection.

ENABLING OBJECTIVE V: Given a pictorial drawing, the student will place a missing line in a given projection view with 85% accuracy.

LEARNING TASKS:

1. Recognize and identify a missing line on an incomplete projection view from a selection of views.
2. Recognize and position a missing line on an incomplete projection view from a selection of lines.

CAD Course Objectives

Unit One: Basic Drawing Operations

Terminal Objective:

Identify hardware, software, and system components for a CAD workstation.

Enabling Objectives:

(1) Identify terminology associated with CAD workstation hardware and software.

(2) Locate and describe system components of a specified CAD workstation.

(3) Identify CAD workstation configuration from a list of configuration prompts.

Terminal Objective:

Apply system start-up procedures to operate CAD workstation.

Enabling Objectives:

(1) Load CAD software from both floppy-disk and fixed disk formats.

(2) Verify loading operation by accessing main menu.

(3) Enter CAD software program via prompts from main menu.

(4) Verify access to all main menu options via keyboard and mouse (if available on system).

(5) Verify access to all main menu options via digitizer tablet (if available on system).

Terminal Objective:

Identify functions available through menus and sub-menus, including prompted functions.

Enabling Objectives:

(1) Describe the function of the "root" menu.

(2) Describe the relationship between the root menu and other menus on the display screen.

(3) Identify the major functions performed by menu items found on the root menu.

(4) Trace a sequence of CAD operations using a chart depicting the menu structure.

(5) Respond to a system prompt via appropriate keyboard or mouse entries.

Terminal Objective:

Apply the Cartesian Coordinate System for readout and entry of drawing entities.

Enabling Objectives:

(1) Describe the cartesian coordinate system as it applies to CAD.

(2) Define the terms associated with the cartesian coordinate system, to include: POLAR, ABSOLUTE, and RELATIVE coordinates.

(3) Interpret the coordinate readout display for each type available with the CAD software.

Note: The software version may include the following types: decimal, engineering, and architectual.

(4) Locate a point on a drawing from ABSOLUTE coordinates.

(5) Locate a point on a drawing from RELATIVE coordinates.

(6) Locate a point on a drawing from POLAR coordinates.

(7) Locate specified points on a drawing using a combination of the three types of coordinates.

Terminal Objective:

Perform operational aids using function keys and keyboard entry, using applicable command sequences.

Enabling Objectives:

(1) Use appropriate function keys and keyboard entry sequences to create drawing entities.

(2) Demonstrate use of prompt sequences by entering correct responses from keyboard or function keys.

Terminal Objective:

Draw LINE segments and use command sequences to modify the line(s).

Enabling Objectives:

(1) Develop a line drawing from a set of specifications or sketch.

(2) EDIT a line drawing using the BREAK, MOVE, and ERASE commands.

(3) Manipulate drawing display with applicable commands, to include REDRAW, ZOOM, PAN, VIEW, and REGEN.

(4) Set UNITS and LIMITS on a drawing to values other than default values.

Terminal Objective:

Perform tasks associated with exiting a drawing file.

Enabling Objectives:

(1) Demonstrate use of the UTILITY function(s).

(2) Use the SAVE command to name (or rename) and save a drawing file.

(3) Describe the difference between SAVE and QUIT commands.

(4) QUIT a working drawing.

(5) Describe the use of the END command in terms of ".bak" files.

(6) Describe the precautions to be taken when invoking the QUIT command.

(7) Exit the program to the system prompt.

(8) Shut-down the system.

Unit Two: Mouse and Digitizer Pad Use

Terminal Objective A:

Activate and use mouse and/or digitizer pad (alternately with keyboard) to perform selected CAD drawing tasks.

Enabling Objectives:

(1) Activate mouse and digitizer pad for task completion following a specified series of commands.

(2) Using an active drawing file, establish screen cursor coordinates through mouse, digitiser pad, and keyboard controls.

(3) Input screen data using appropriate digitizer or mouse button control(s).

(4) Activate cursor control mode from digitizer/mouse to keyboard.

Terminal Objective B:

Set mode conditions to activate drawing functions.

Enabling Objectives:

(1) Initiate AXIS ruler lines using TICK spacing and ASPECT specifications.

(2) Activate (and reactivate) the COORDINATE display from the command SUBMENU.

(3) Enable the DRAG request sequence from the command SUBMENU.

(4) Set the value and aspect for dot-to-dot spacing for a reference GRID.

(5) Activate (and deactivate) ORTHO command to accomodate orthogonal or angular construction(s).

(6) Using alignment specifications, set SNAP incremental values.

(7) Within an active drawing file, set and manipulate the OSNAP and APERATURE commands to connect specified lines.

(8) Manipulate MODE commands with TOGGLE control keys.

Terminal Objective C:

Create working drawings using specified commands.

Enabling Objectives:

(1) Construct ARCS with specified submenu options, and employ DRAG command to reposition the arc(s).

(2) Construct a CIRCLE with specified submenu options, and use DRAG command to dynamically change size.

(3) Construct TEXT string(s) of varying size and type.

(4) Construct adjacent lines using TRACE command in both FILL On and OFF conditions.

(5) Enter a POINT on a drawing based on supplied coordinate(s).

(6) SKETCH a line from map grid coordinates and/or irregular outline(s).

(7) Construct PLINE (polylines) in straight-line and arc segments.

Terminal Objective D:

Format a blank floppy diskette using a specified operating system.

Enabling Objectives:

(1) State precautions to be taken to protect floppy-disk media.

(2) Format a floppy-disk for use, and verify format with a check-disk command.

(3) Create a directory on a pre-formatted diskette to accomodate drawing files.

(4) Using a print-screen command, obtain a print-out of a floppy-disk directory.

Unit Three: Editing Drawing Files

Terminal Objective E:

Access a working drawing and edit the drawing with specified commands.

Enabling Objectives:

(1) ARRAY a selected object in a rectangular and/or circular pattern for a given specification.

(2) CHAMFER a corner or fillet when given intersecting lines and/or distance specifications.

(3) CHANGE the properties of specific drawing entities, and enter changes at given coordinate(s).

(4) COPY entities to new coordinate locations, and DRAG entities to second displacement point(s).

(5) FILLET lines to a specified radius, when given a set of disconnected lines.

(6) MIRROR a selected object in both horizontal and vertical aspects, to include retaining and deletion of original object.

(7) REPEAT (and ENDREP) columns and rows to create a specified pattern.

Unit Four: Drawing Construction From Specifications

Terminal Objective F:

Construct a working drawing of a specified type using all applicable commands and subcommands.

Enabling Objectives:

(1) Construct an architectural drawing from a floor plan.

(2) Construct a mechanical drawing from a sectional view of a common machine part.

(3) Construct an electro-mechanical drawing from a view of a common component.

(4) Develop a technical illustration of a selected object, in oblique view.

Unit Five: Establishing and Using Layers

Terminal Objective G:

Create working drawings with multi-layer features, using a variety of linetypes and colors.

Enabling Objectives:

(1) Assign LAYER colors per drawing specifications or drawing standards.

(2) Assign LINETYPES to an associated LAYER without duplication.

(3) Assign a NAME (option) for each LAYER, using a character string.

(4) Using STATE feature, turn a specified LAYER on-and-off.

(5) Invoke the LIST command to verify a specific LAYER format or configuration.

(6) CHANGE an existing LAYER format to conform to a given set of layer specifications.

(7) Identify layer format(s) on working drawings using LINETYPE LISTING.

Unit Five (cont): Using The INQUIRY Feature

Terminal Objective H:

Load a specified working drawing and use the INQUIRY features to identify the drawing characteristics.

Enabling Objectives:

(1) Invoke the AREA command to determine the area and perimeter of an enclosed polygon.

(2) Identify drawing entity characteristics through use of the DBLIST command.

(3) Determine the distance and angle between designated points through use of the DIST command.

(4) Invoke the ID command to identify the coordinates for a specified point on a working drawing.

(5) LIST information for specified drawing entities on a series of working drawings.

(6) Obtain a report of current drawing values by invoking the STATUS command on a working drawing.

Unit Six: Drawing Entities and Drawing Blocks

Terminal Objective I:

Construct specified drawing entities and drawing blocks, using applicable commands on a working drawing.

Enabling Objectives:

(1) Identify drawing entities entered with a single command.

(2) Identify entities from printed or screen displays.

(3) Identify user specified entities from a supplied list.

Terminal Objective J:

Create and manipulate drawing BLOCKS and WBLOCKS within working drawings.

Enabling Objectives:

(1) Define the BLOCK command in terms of drawing construction.

(2) Define the WBLOCK command in terms of drawing construction.

(3) Identify the command menu(s) used in creating a BLOCK and WBLOCK.

(4) Insert a BLOCK and WBLOCK into an existing drawing file.

(5) Use applicable commands to edit or list a BLOCK and/or WBLOCK prior to INSERTing in a drawing file.

Terminal Objective K:

Use HATCH, FILL, and SOLID commands to create specified patterns within working drawings.

Enabling Objectives:

(1) Identify HATCH patterns from a display or print-out.

(2) Select applicable HATCH patterns for given applications.

(3) Create a HATCH pattern on a working drawing.

(4) FILL a specified drawing entity on a working drawing.

(5) Create a SOLID drawing entity with both FILL-ON and FILL-OFF modes.

Unit Seven: Plotting A Drawing

Terminal Objective:

Configure the system to plot a drawing, and obtain a plot of a specified drawing.

Enabling Objectives:

(1) Enter the configuration data necessary to plot a drawing on the system in use.

(2) Set-up the plotter for use, and load paper.

(3) Access specified drawing file and initiate plotting sequence from keyboard commands.

TEXAS STATE TECHNICAL INSTITUTE

TSTI WACO

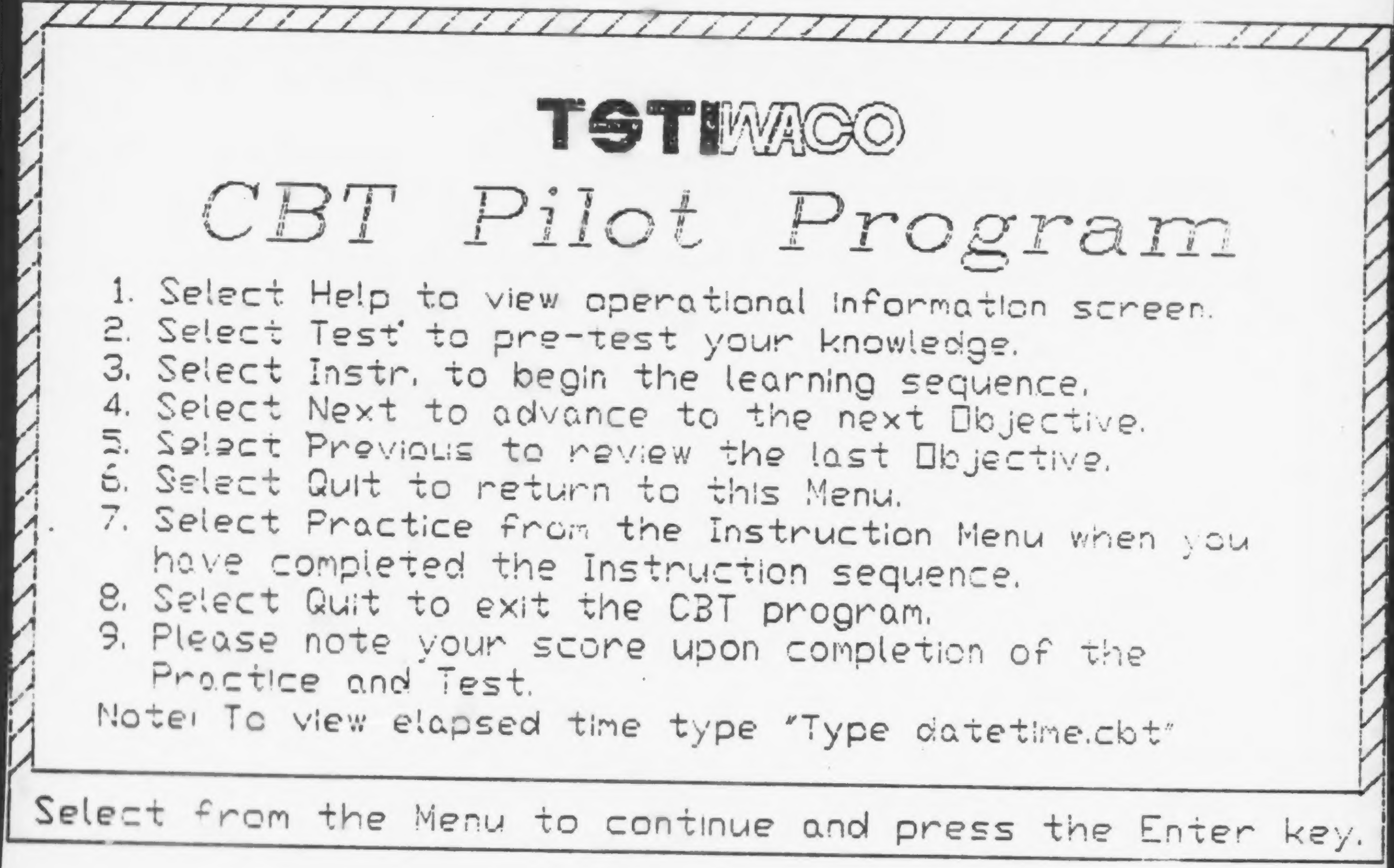
PRESENTS

A

CBT Pilot Program

Designed by Mardelle A. Sauer

Through a grant by the Coordinating Board
Texas College & University System

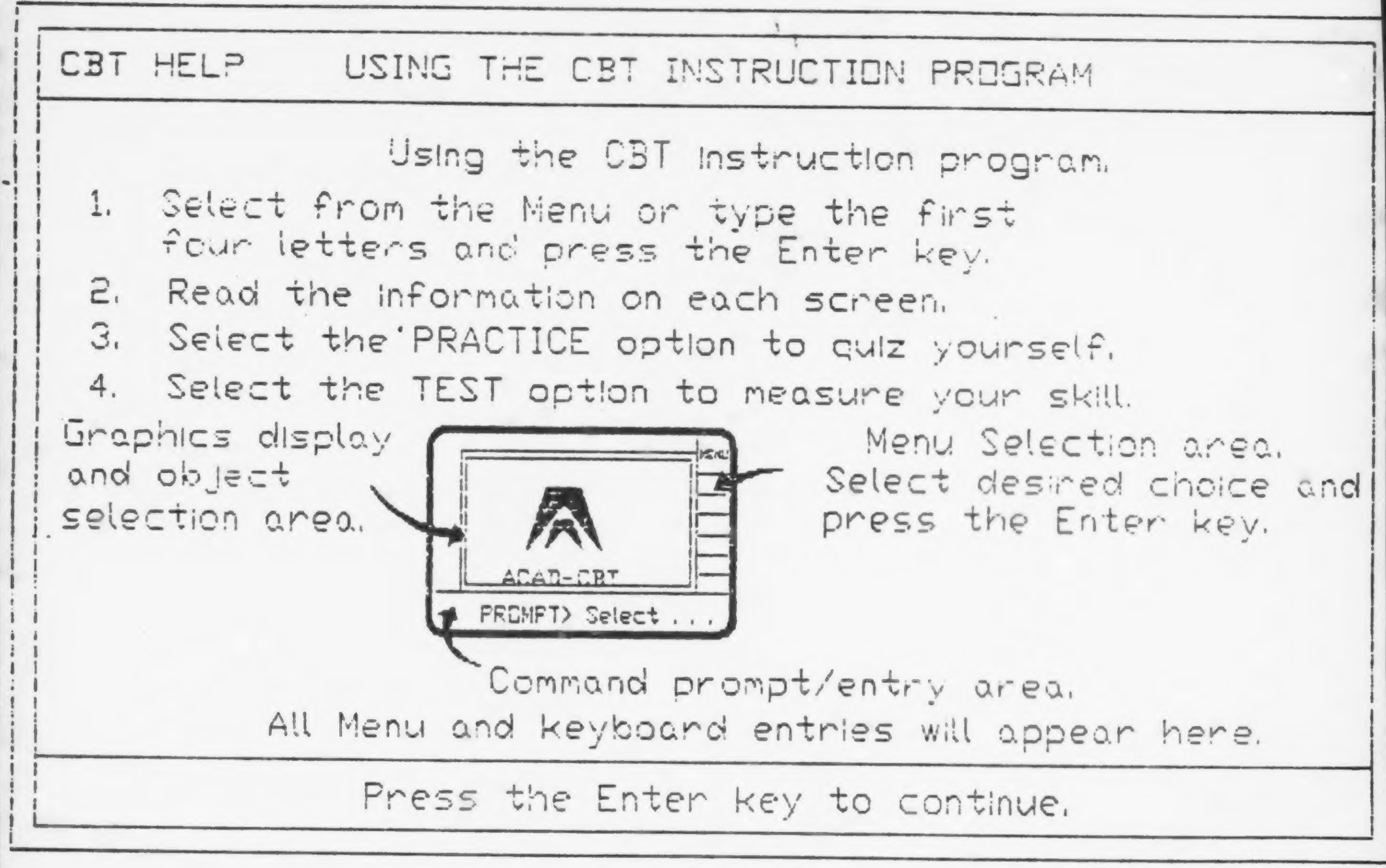


CBT Pilot Program

1. Select Help to view operational information screen.
2. Select Test to pre-test your knowledge.
3. Select Instr. to begin the learning sequence.
4. Select Next to advance to the next Objective.
5. Select Previous to review the last Objective.
6. Select Quit to return to this Menu.
7. Select Practice from the Instruction Menu when you have completed the Instruction sequence.
8. Select Quit to exit the CBT program.
9. Please note your score upon completion of the Practice and Test.

Note: To view elapsed time type "Type datetime.cbt"

Select from the Menu to continue and press the Enter key.



CBT HELP USING THE CBT INSTRUCTION PROGRAM

Using the CBT instruction program.

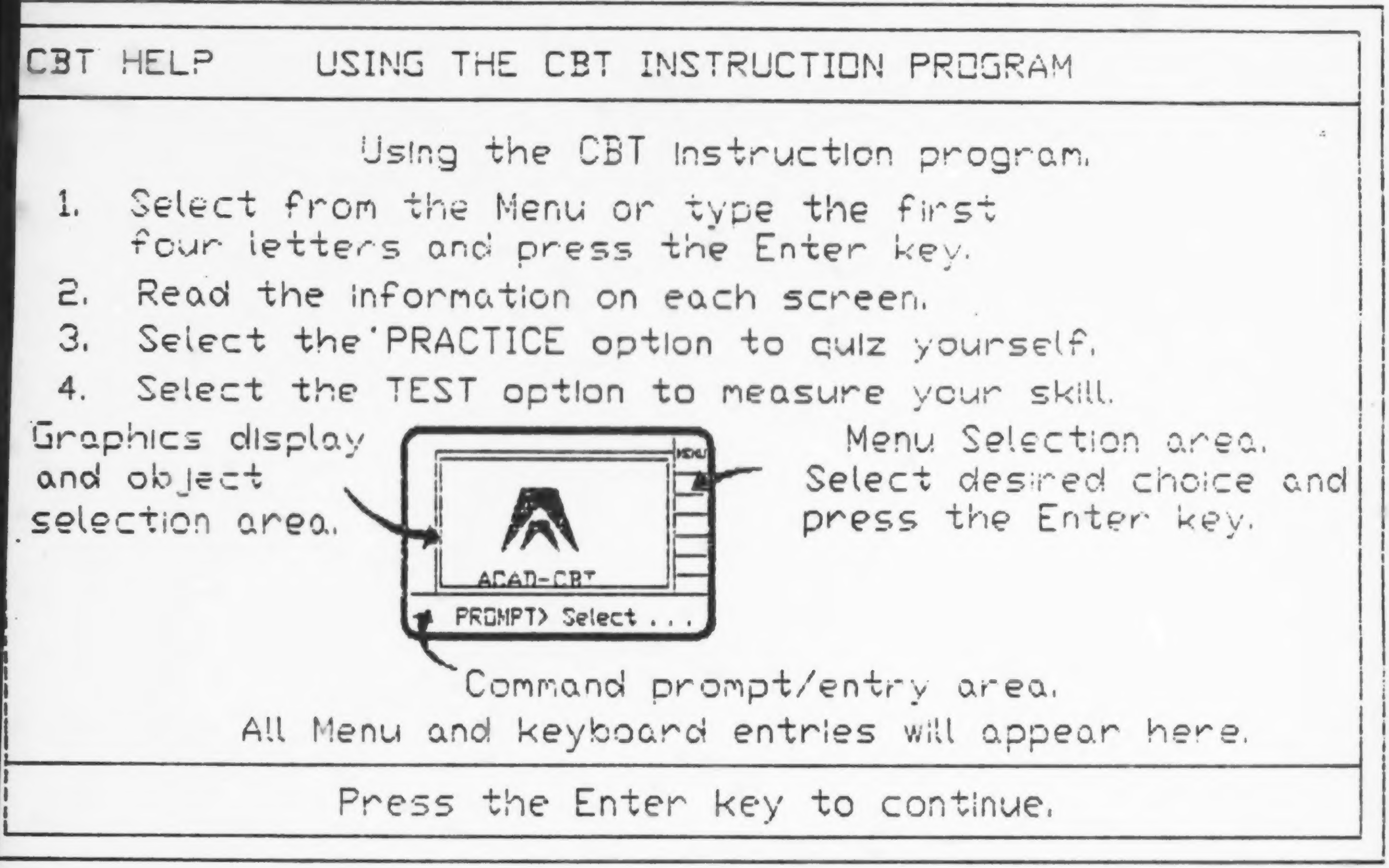
1. Select from the Menu or type the first four letters and press the Enter key.
2. Read the information on each screen.
3. Select the PRACTICE option to quiz yourself.
4. Select the TEST option to measure your skill.

Graphics display and object selection area.

Menu Selection area. Select desired choice and press the Enter key.

Command prompt/entry area. All Menu and keyboard entries will appear here.

Press the Enter key to continue.



CBT HELP USING THE CBT INSTRUCTION PROGRAM

Using the CBT instruction program.

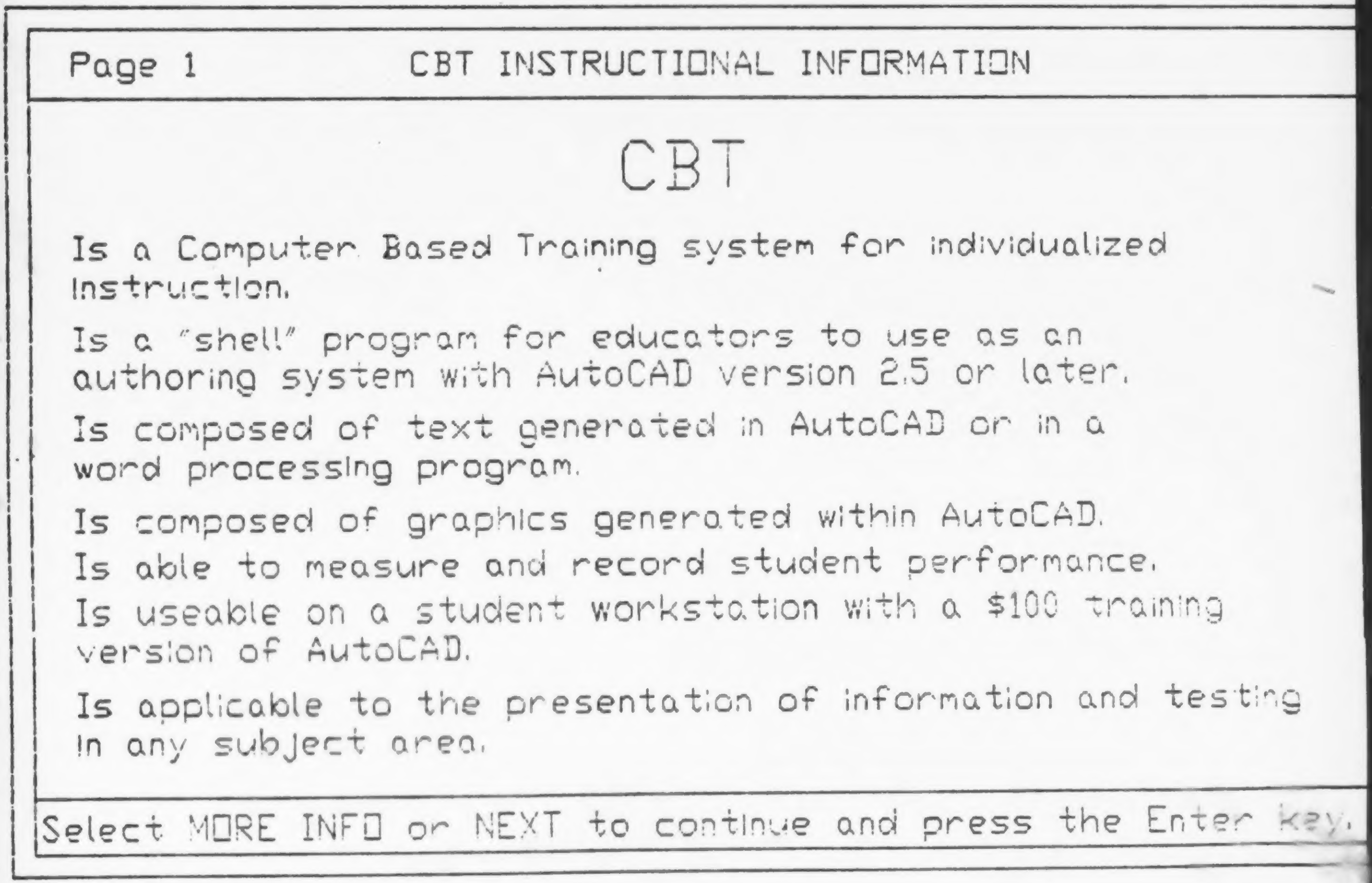
1. Select from the Menu or type the first four letters and press the Enter key.
2. Read the information on each screen.
3. Select the PRACTICE option to quiz yourself.
4. Select the TEST option to measure your skill.

Graphics display and object selection area.

Menu Selection area. Select desired choice and press the Enter key.

Command prompt/entry area. All Menu and keyboard entries will appear here.

Press the Enter key to continue.



Page 1 CBT INSTRUCTIONAL INFORMATION

CBT

Is a Computer Based Training system for individualized instruction.

Is a "shell" program for educators to use as an authoring system with AutoCAD version 2.5 or later.

Is composed of text generated in AutoCAD or in a word processing program.

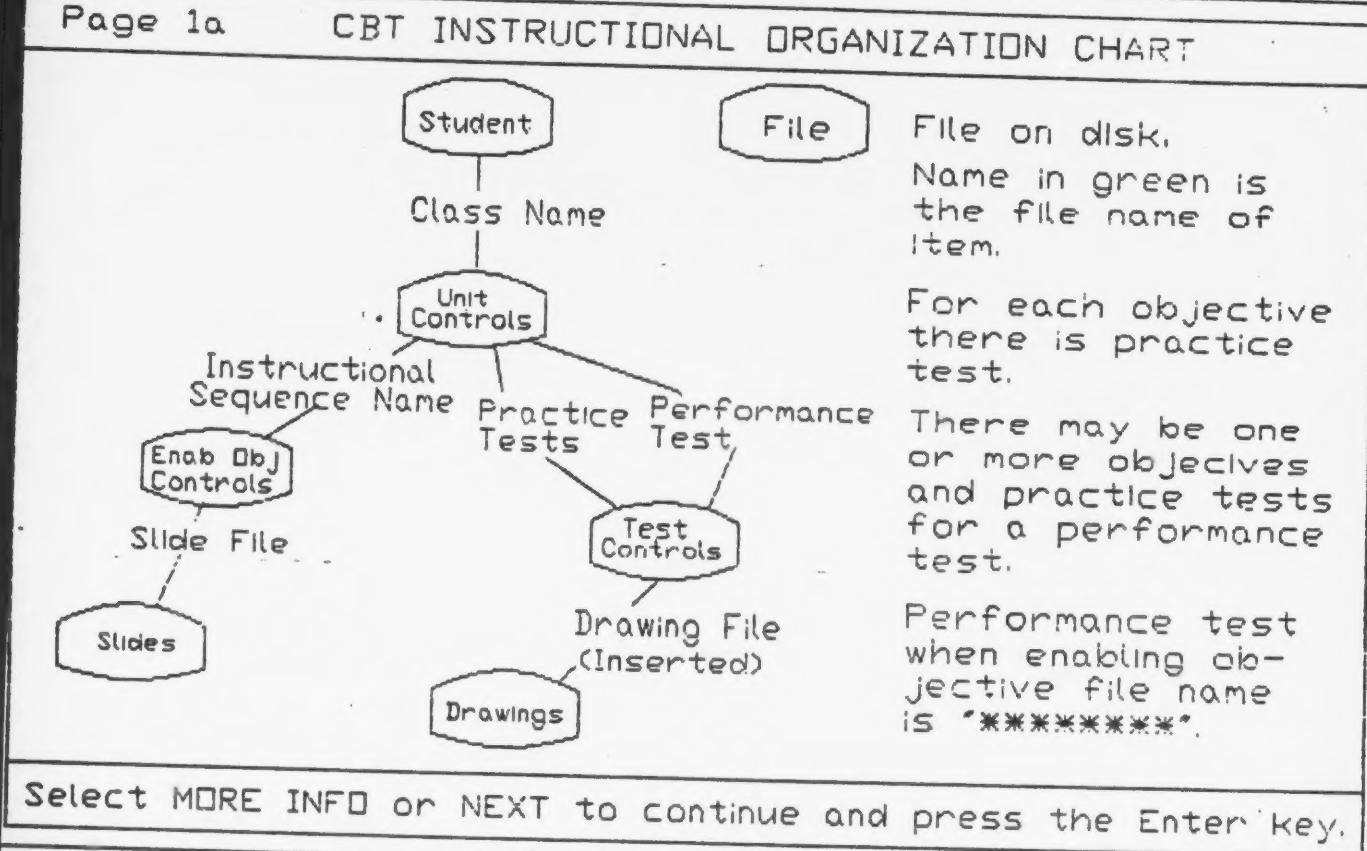
Is composed of graphics generated within AutoCAD.

Is able to measure and record student performance.

Is useable on a student workstation with a $100 training version of AutoCAD.

Is applicable to the presentation of information and testing in any subject area.

Select MORE INFO or NEXT to continue and press the Enter key.


Student
Class Name
Unit Controls
Instructional Sequence Name
Practice Tests
Performance Test
Enab Obj Controls
Slide File
Slides
Test Controls
Drawing File (Inserted)
Drawings
File

Page 1a CBT INSTRUCTIONAL ORGANIZATION CHART

File on disk.

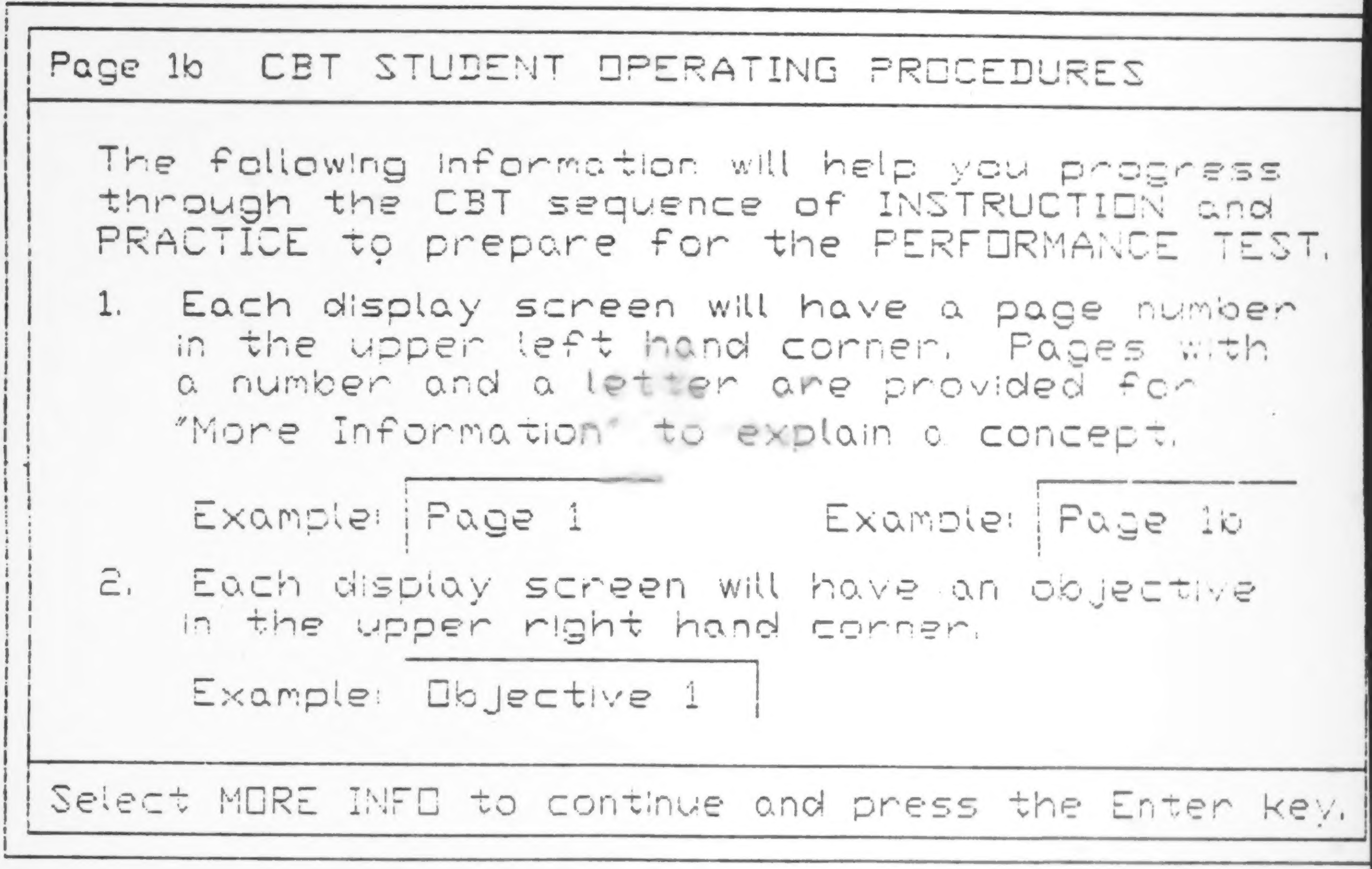
Name in green is the file name of item.

For each objective there is practice test.

There may be one or more objecives and practice tests for a performance test.

Performance test when enabling objective file name is '*******'.

Select MORE INFO or NEXT to continue and press the Enter key.



Page 1b CBT STUDENT OPERATING PROCEDURES

The following information will help you progress through the CBT sequence of INSTRUCTION and PRACTICE to prepare for the PERFORMANCE TEST.

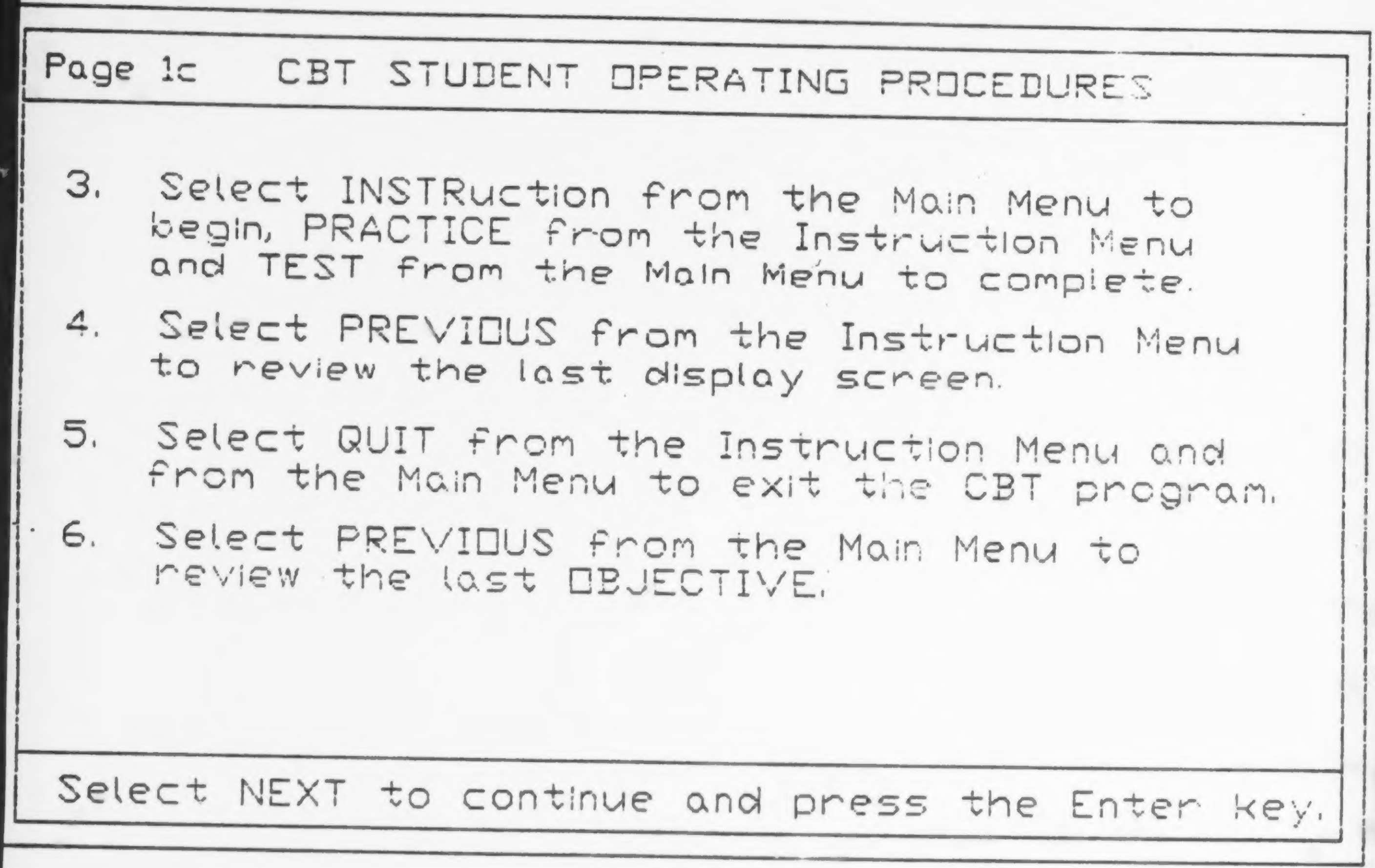
1. Each display screen will have a page number in the upper left hand corner. Pages with a number and a letter are provided for "More Information" to explain a concept.

   Example: Page 1 Example: Page 1b

2. Each display screen will have an objective in the upper right hand corner.

   Example: Objective 1

Select MORE INFO to continue and press the Enter key.



Page 1c CBT STUDENT OPERATING PROCEDURES

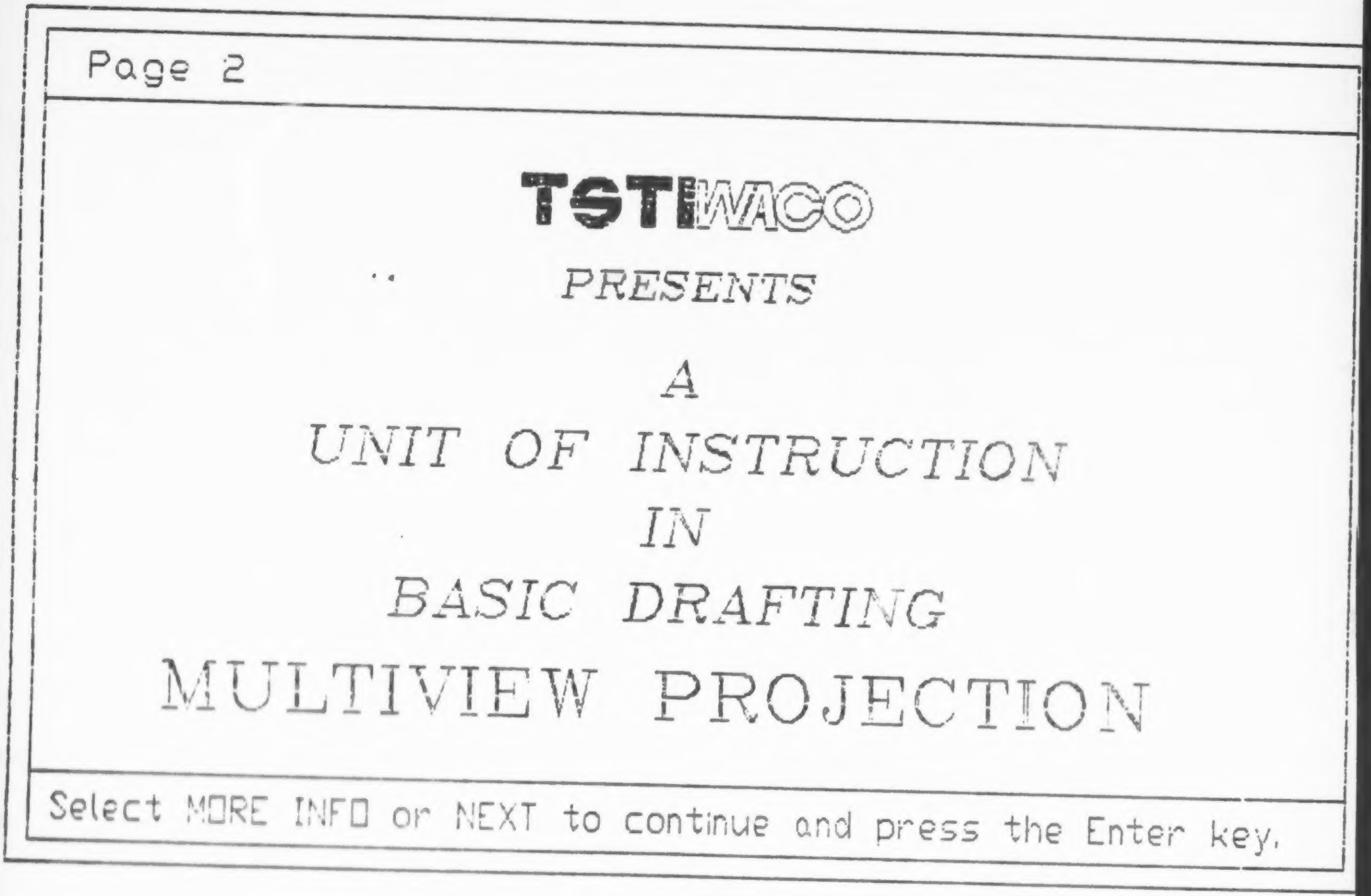
3. Select INSTRuction from the Main Menu to begin, PRACTICE from the Instruction Menu and TEST from the Main Menu to complete.

4. Select PREVIOUS from the Instruction Menu to review the last display screen.

5. Select QUIT from the Instruction Menu and from the Main Menu to exit the CBT program.

6. Select PREVIOUS from the Main Menu to review the last OBJECTIVE.

Select NEXT to continue and press the Enter key.



Page 2

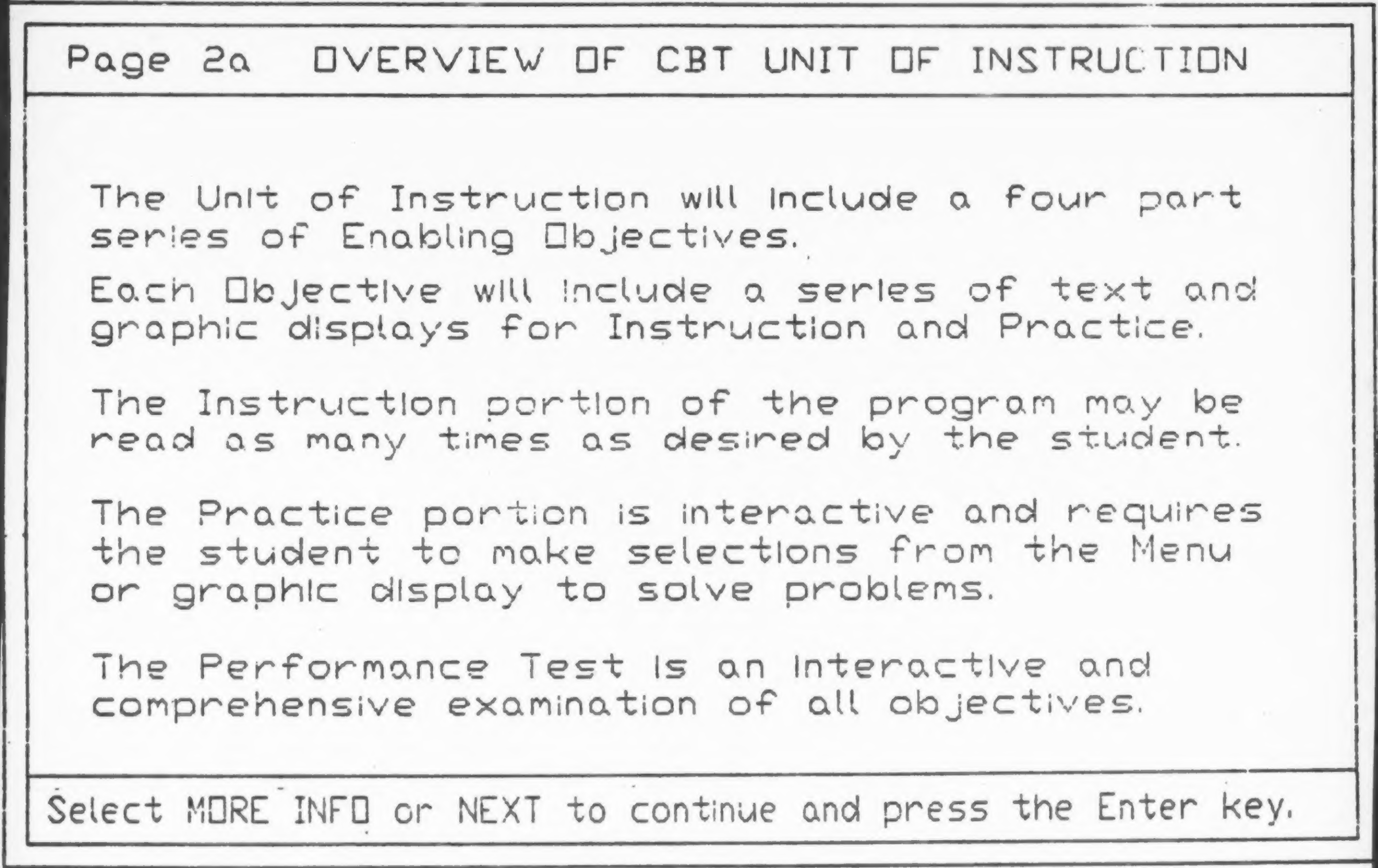
TSTI WACO

PRESENTS

A
UNIT OF INSTRUCTION
IN
BASIC DRAFTING

MULTIVIEW PROJECTION

Select MORE INFO or NEXT to continue and press the Enter key.



Page 2a OVERVIEW OF CBT UNIT OF INSTRUCTION

The Unit of Instruction will include a four part series of Enabling Objectives.

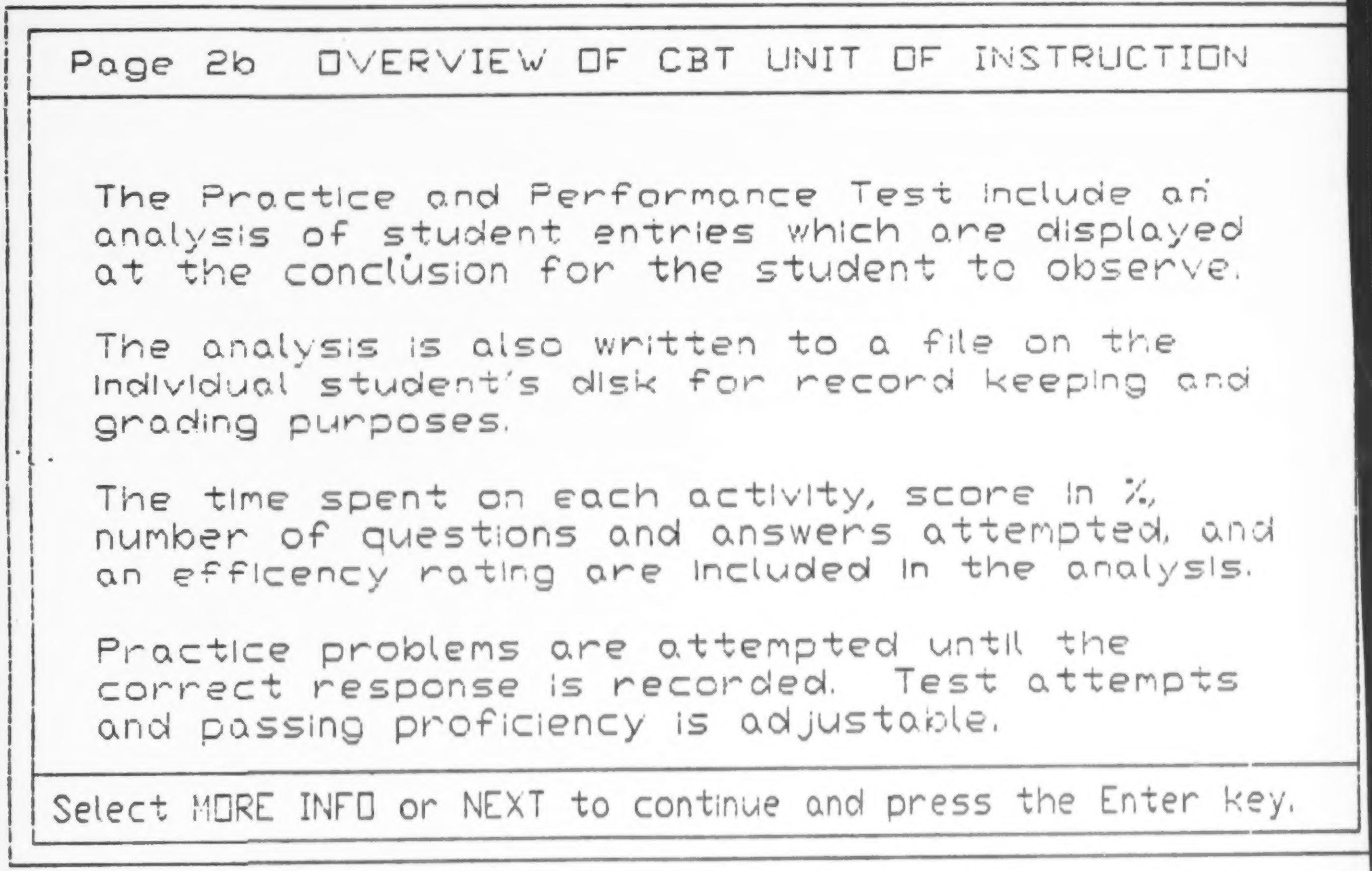
Each Objective will include a series of text and graphic displays for Instruction and Practice.

The Instruction portion of the program may be read as many times as desired by the student.

The Practice portion is interactive and requires the student to make selections from the Menu or graphic display to solve problems.

The Performance Test is an interactive and comprehensive examination of all objectives.

Select MORE INFO or NEXT to continue and press the Enter key.



Page 2b OVERVIEW OF CBT UNIT OF INSTRUCTION

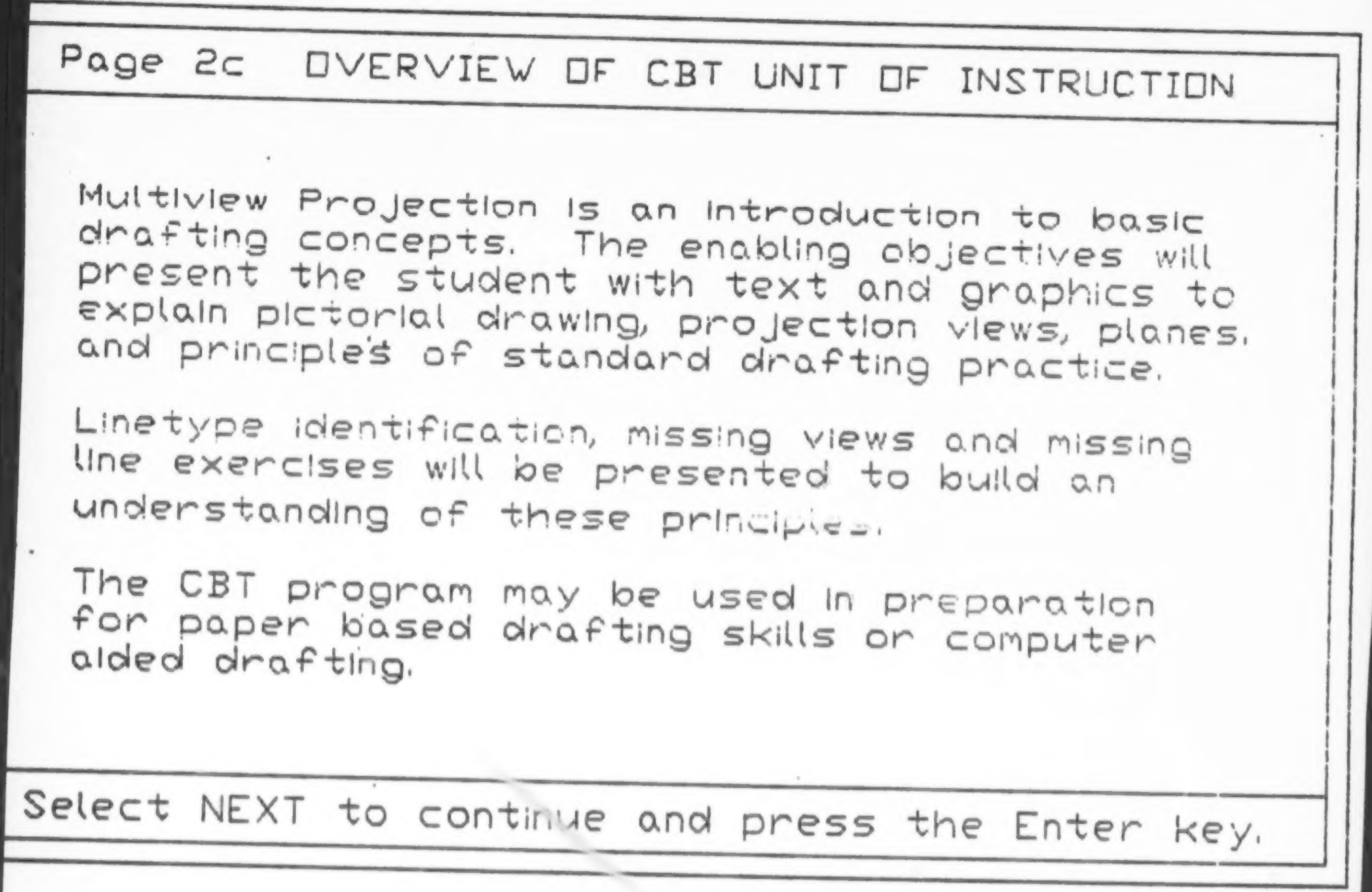
The Practice and Performance Test include an analysis of student entries which are displayed at the conclusion for the student to observe.

The analysis is also written to a file on the individual student's disk for record keeping and grading purposes.

The time spent on each activity, score in %, number of questions and answers attempted, and an efficency rating are included in the analysis.

Practice problems are attempted until the correct response is recorded. Test attempts and passing proficiency is adjustable.

Select MORE INFO or NEXT to continue and press the Enter key.



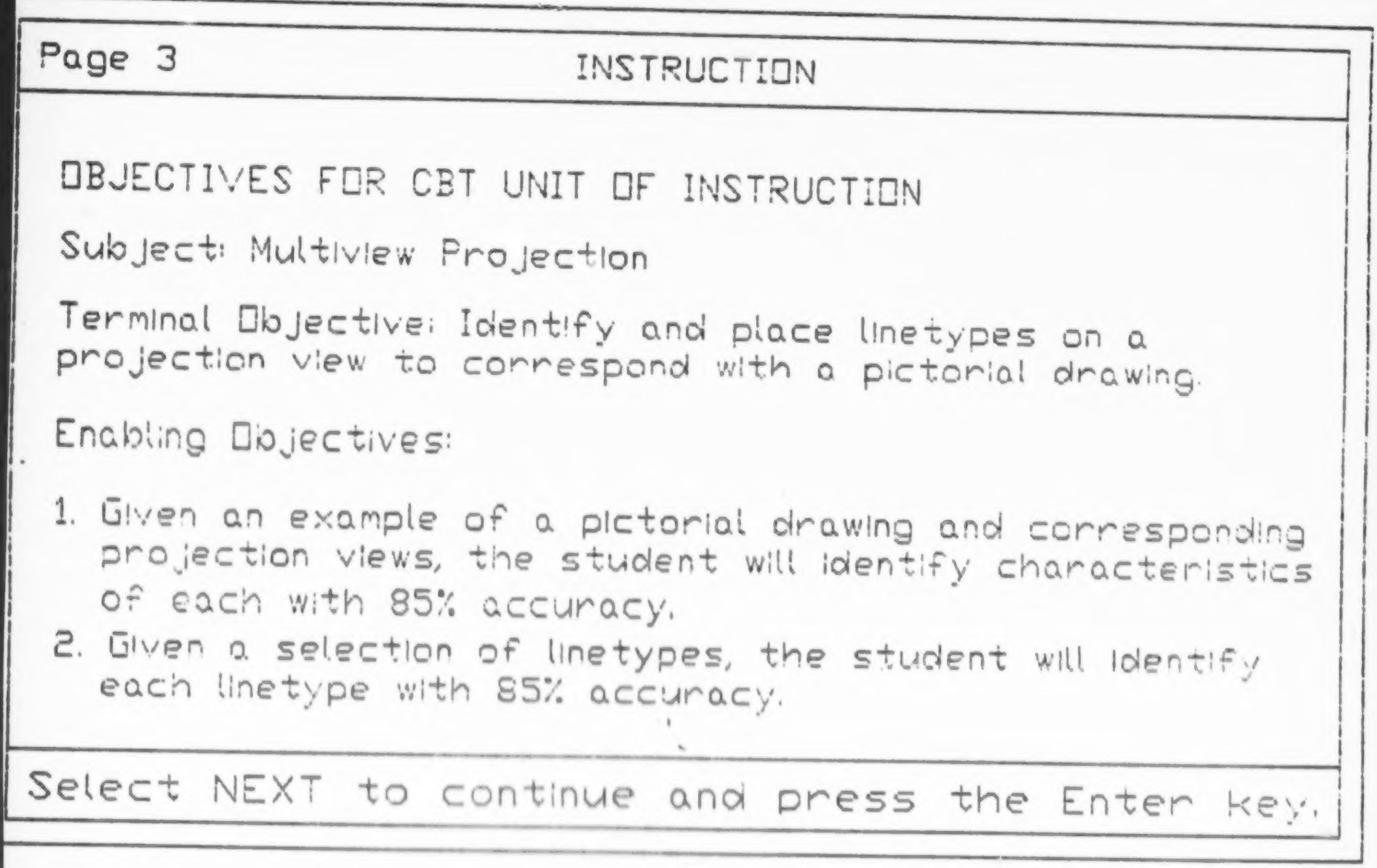
Page 2c OVERVIEW OF CBT UNIT OF INSTRUCTION

Multiview Projection is an introduction to basic drafting concepts. The enabling objectives will present the student with text and graphics to explain pictorial drawing, projection views, planes, and principles of standard drafting practice.

Linetype identification, missing views and missing line exercises will be presented to build an understanding of these principles.

The CBT program may be used in preparation for paper based drafting skills or computer aided drafting.

Select NEXT to continue and press the Enter key.



Page 3 INSTRUCTION

OBJECTIVES FOR CBT UNIT OF INSTRUCTION

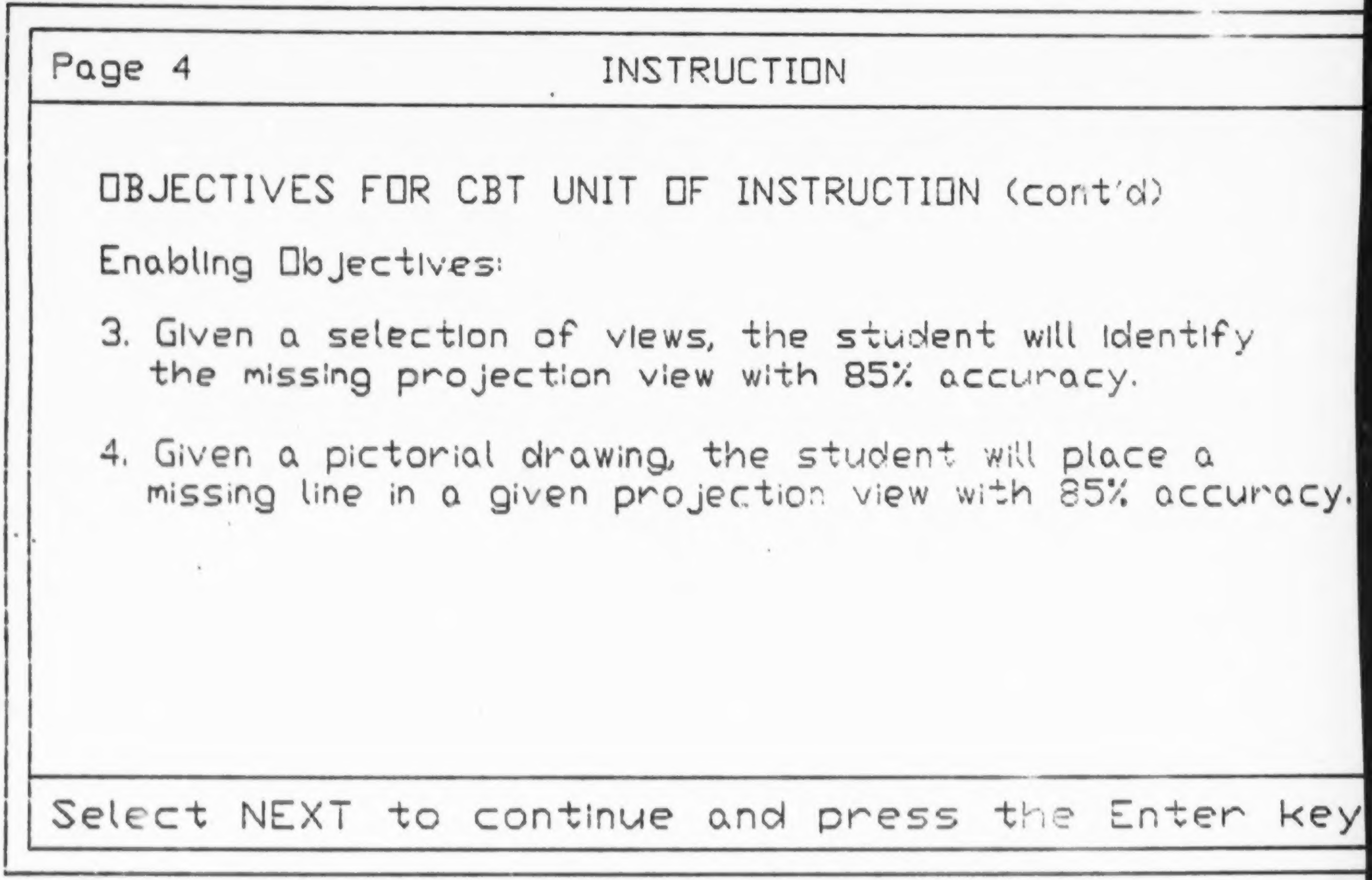
Subject: Multiview Projection

Terminal Objective: Identify and place linetypes on a projection view to correspond with a pictorial drawing.

Enabling Objectives:

1. Given an example of a pictorial drawing and corresponding projection views, the student will identify characteristics of each with 85% accuracy.
2. Given a selection of linetypes, the student will identify each linetype with 85% accuracy.

Select NEXT to continue and press the Enter key.



Page 4 INSTRUCTION

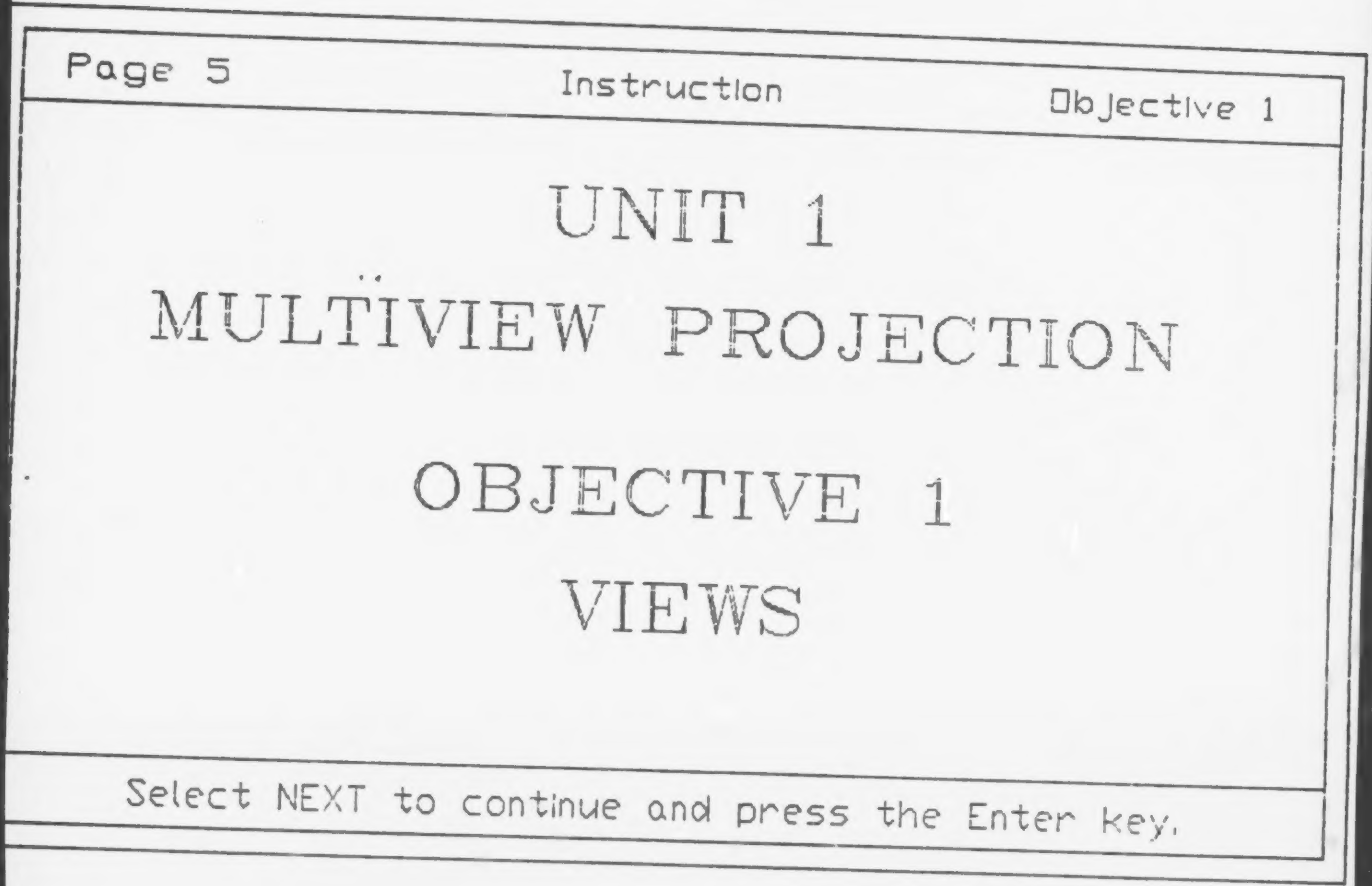
OBJECTIVES FOR CBT UNIT OF INSTRUCTION (cont'd)

Enabling Objectives:

3. Given a selection of views, the student will identify the missing projection view with 85% accuracy.

4. Given a pictorial drawing, the student will place a missing line in a given projection view with 85% accuracy.

Select NEXT to continue and press the Enter key



Page 5 Instruction Objective 1

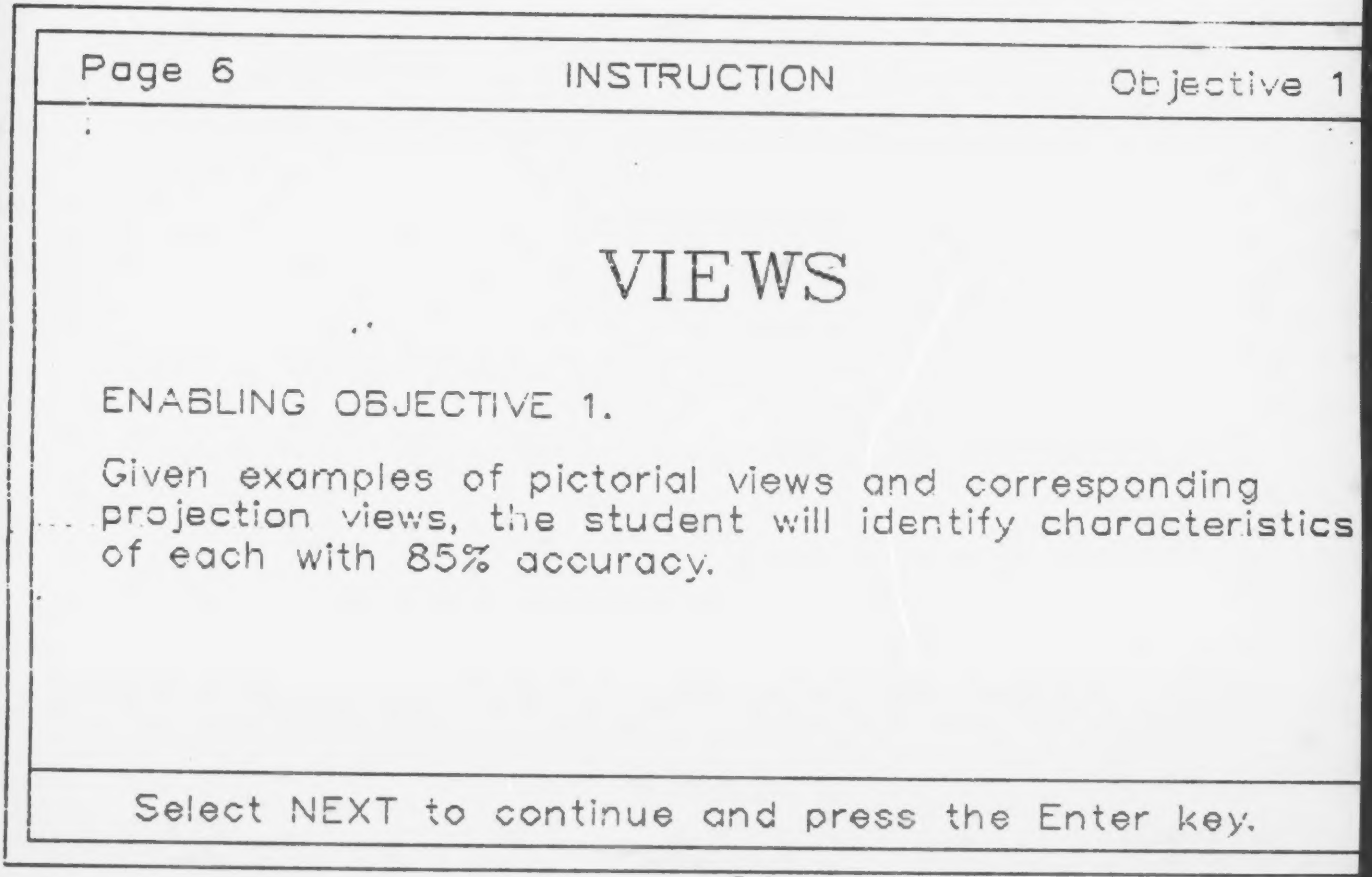
UNIT 1

MULTIVIEW PROJECTION

OBJECTIVE 1

VIEWS

Select NEXT to continue and press the Enter key.



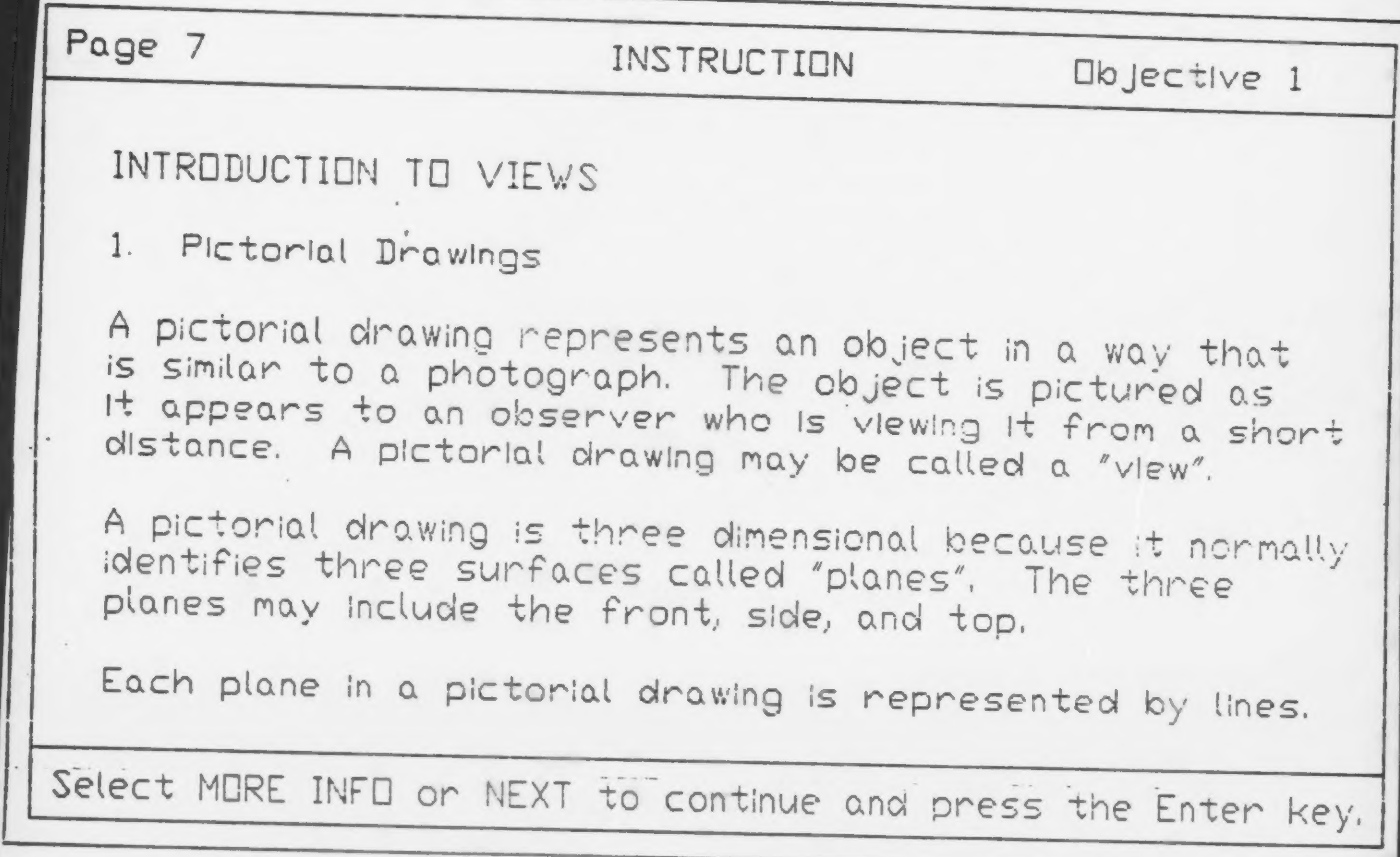
Page 6 INSTRUCTION Objective 1

VIEWS

ENABLING OBJECTIVE 1.

Given examples of pictorial views and corresponding projection views, the student will identify characteristics of each with 85% accuracy.

Select NEXT to continue and press the Enter key.



Page 7 INSTRUCTION Objective 1

INTRODUCTION TO VIEWS

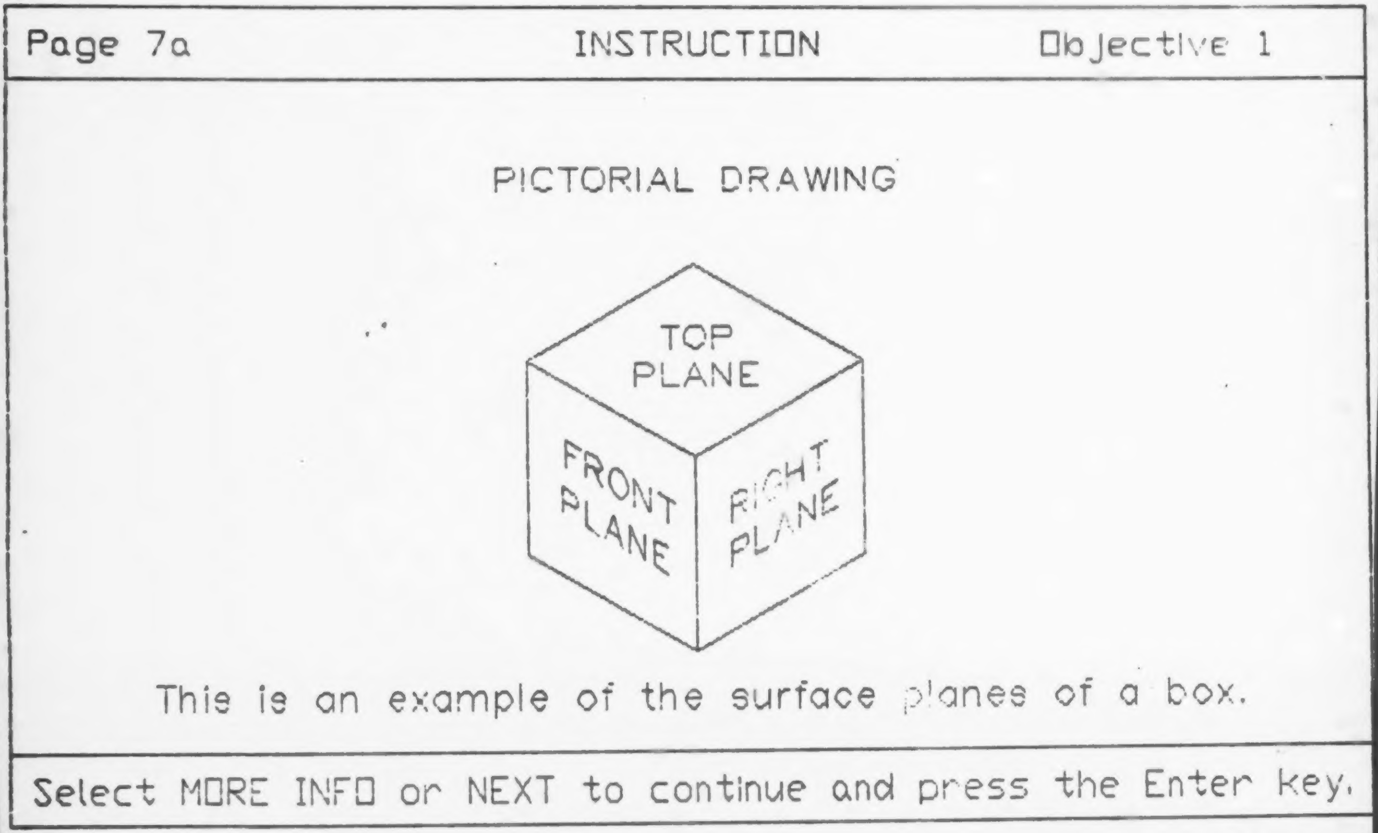
1. Pictorial Drawings

A pictorial drawing represents an object in a way that is similar to a photograph. The object is pictured as it appears to an observer who is viewing it from a short distance. A pictorial drawing may be called a "view".

A pictorial drawing is three dimensional because it normally identifies three surfaces called "planes". The three planes may include the front, side, and top.

Each plane in a pictorial drawing is represented by lines.

Select MORE INFO or NEXT to continue and press the Enter key.



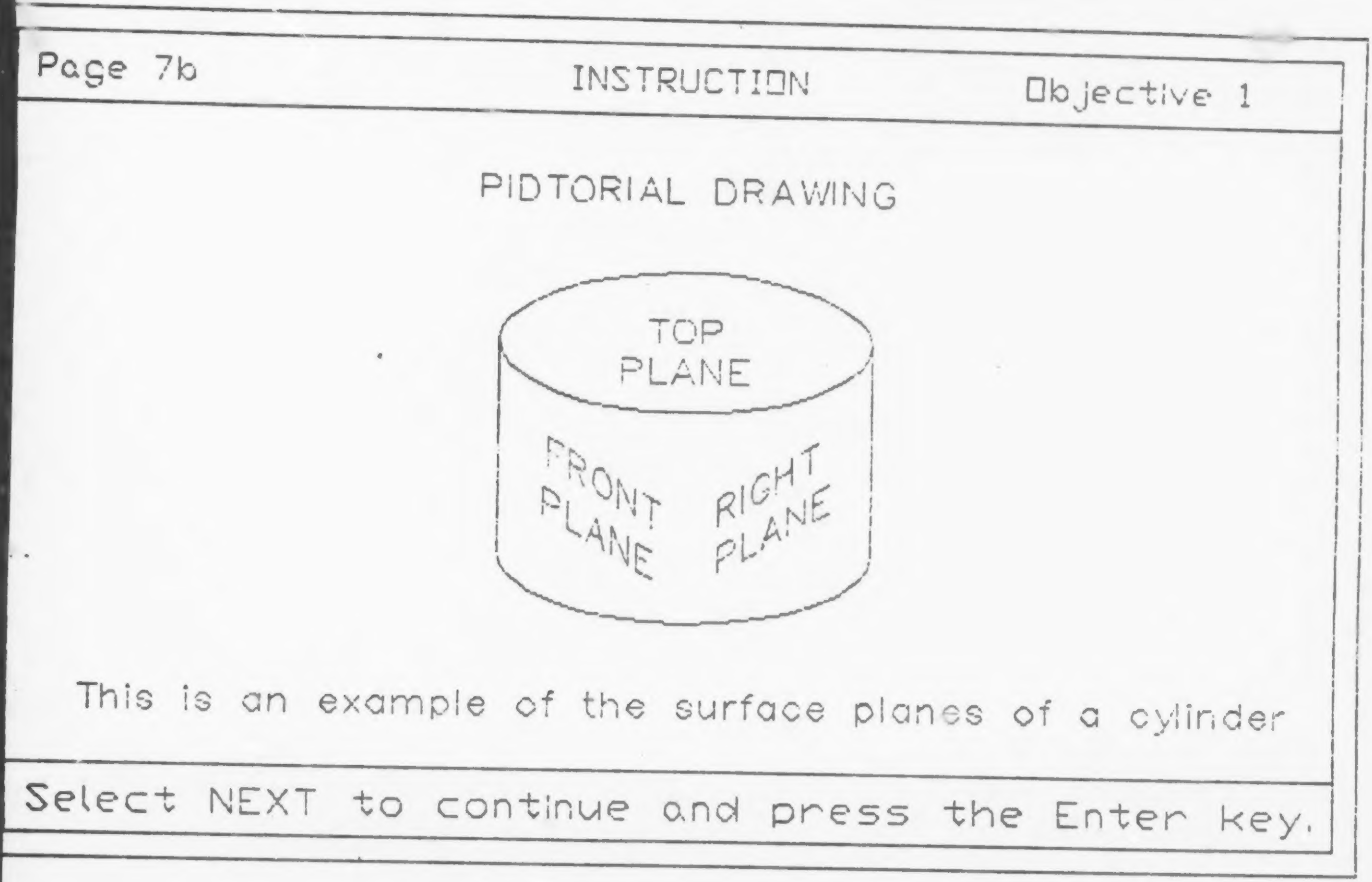
Page 7a INSTRUCTION Objective 1

PICTORIAL DRAWING

TOP PLANE
FRONT PLANE
RIGHT PLANE

This is an example of the surface planes of a box.

Select MORE INFO or NEXT to continue and press the Enter key.



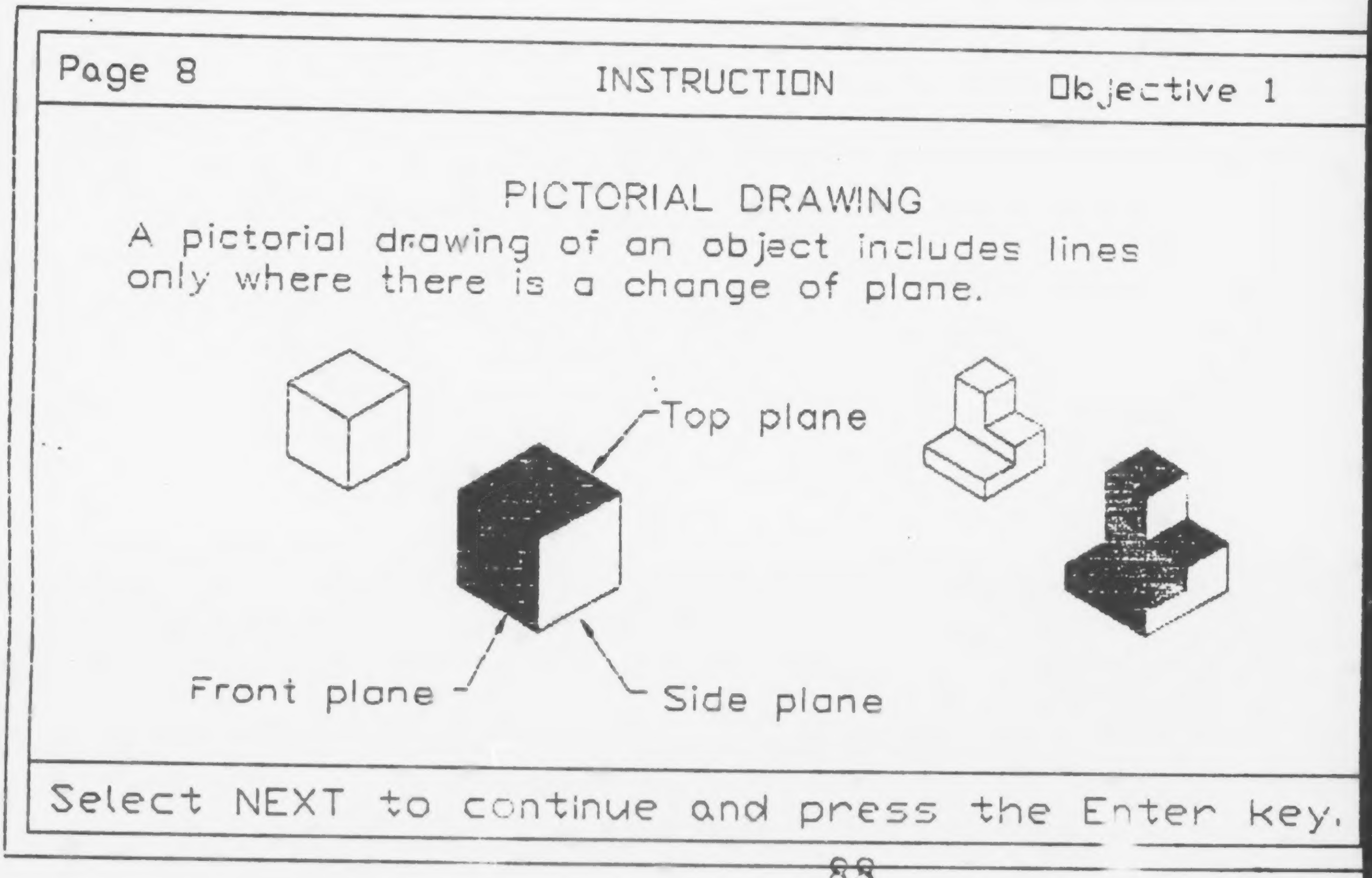
Page 7b INSTRUCTION Objective 1

PIDTORIAL DRAWING

TOP PLANE
FRONT PLANE
RIGHT PLANE

This is an example of the surface planes of a cylinder

Select NEXT to continue and press the Enter key.



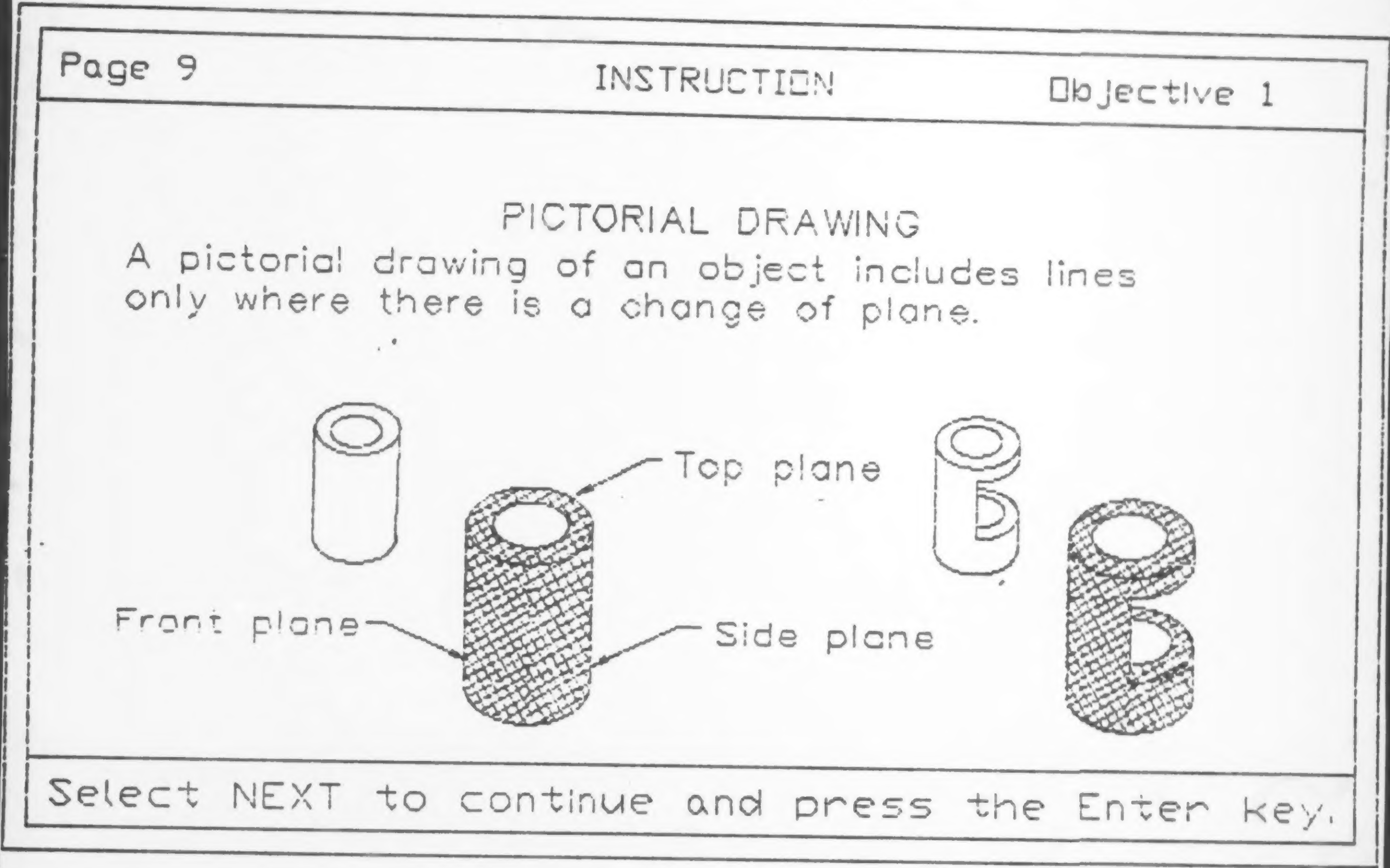
Page 8 INSTRUCTION Objective 1

PICTORIAL DRAWING

A pictorial drawing of an object includes lines only where there is a change of plane.

Top plane
Front plane
Side plane

Select NEXT to continue and press the Enter key.



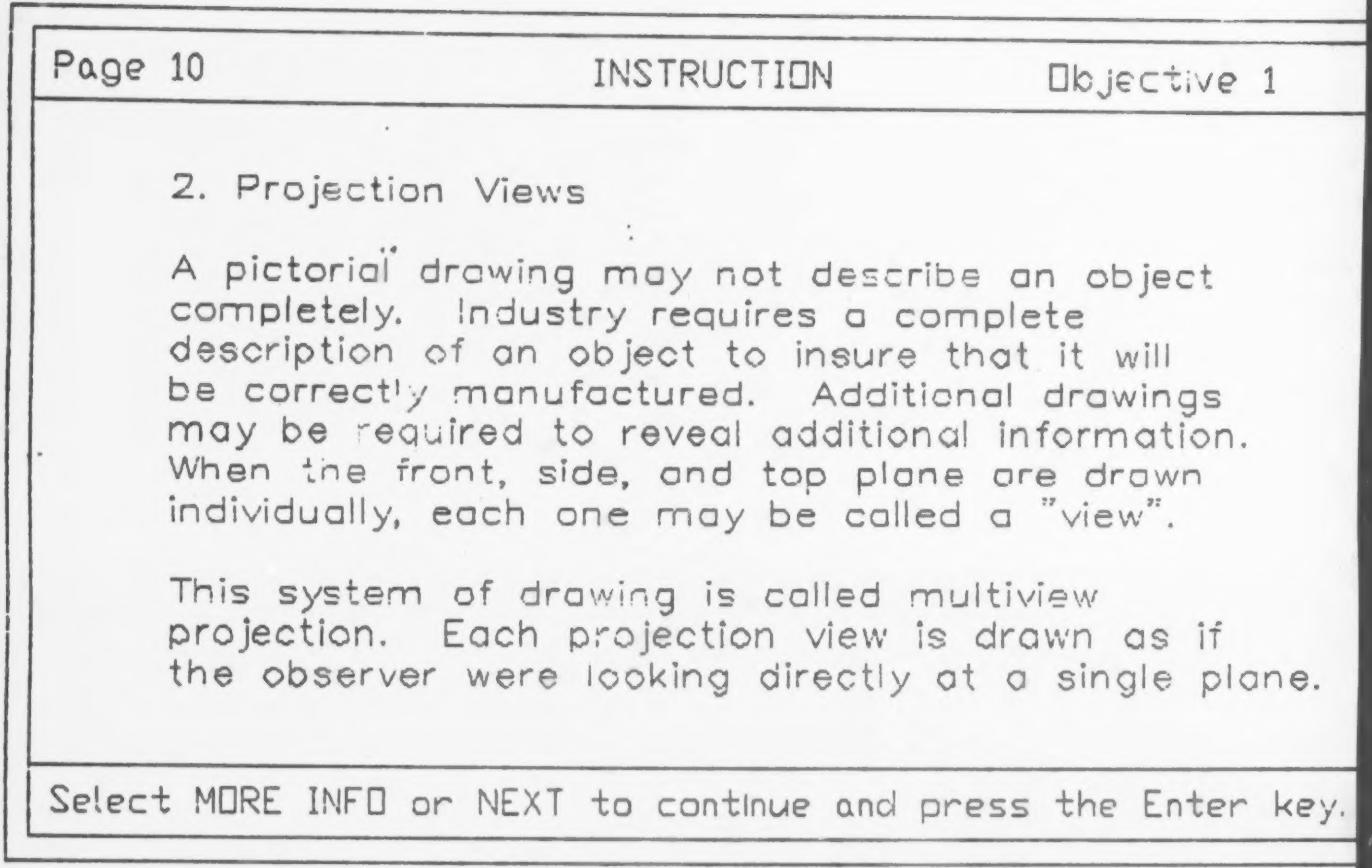
Page 9 INSTRUCTION Objective 1

PICTORIAL DRAWING

A pictorial drawing of an object includes lines only where there is a change of plane.

Top plane
Front plane
Side plane

Select NEXT to continue and press the Enter key.



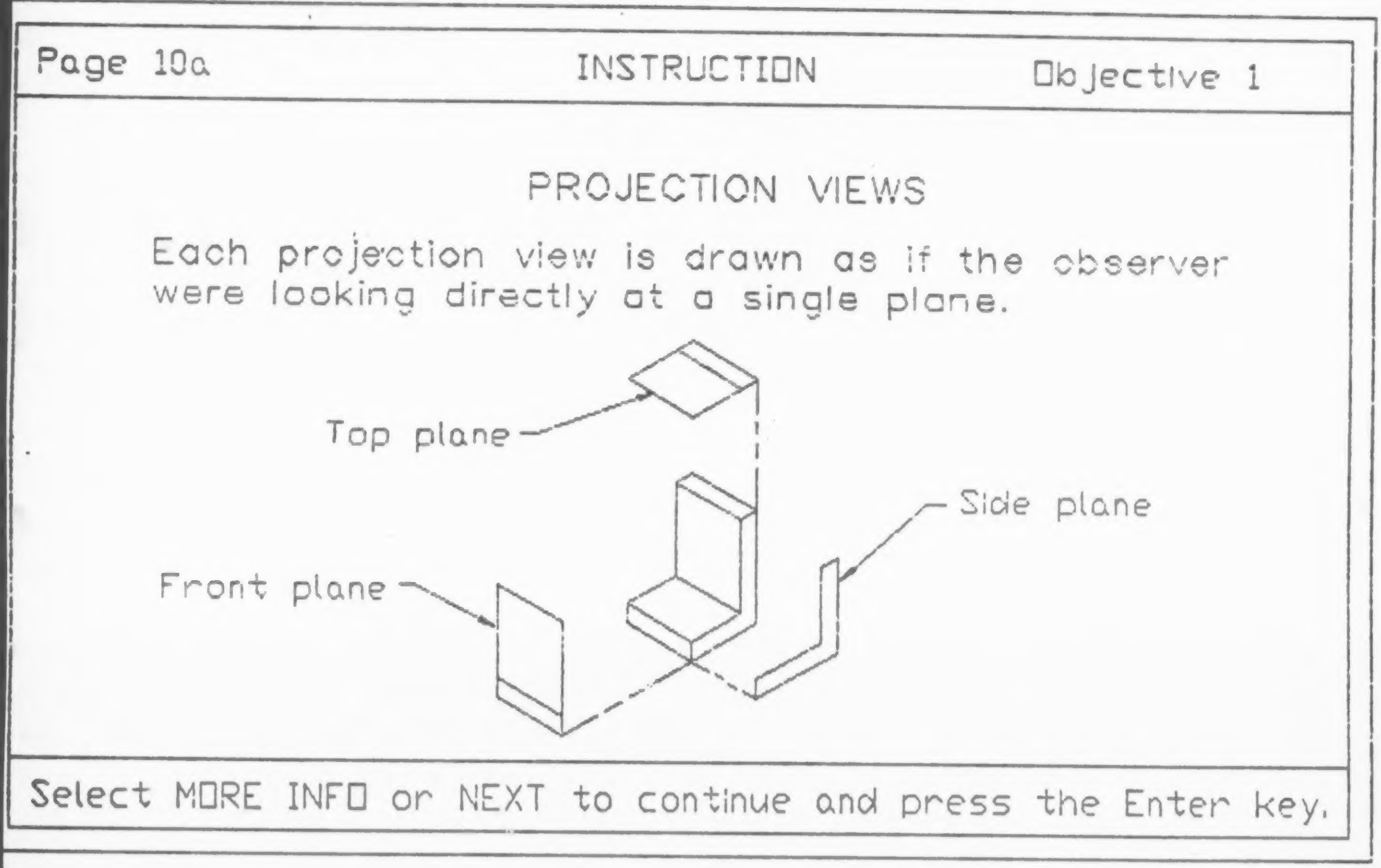
Page 10 INSTRUCTION Objective 1

2. Projection Views

A pictorial drawing may not describe an object completely. Industry requires a complete description of an object to insure that it will be correctly manufactured. Additional drawings may be required to reveal additional information. When the front, side, and top plane are drawn individually, each one may be called a "view".

This system of drawing is called multiview projection. Each projection view is drawn as if the observer were looking directly at a single plane.

Select MORE INFO or NEXT to continue and press the Enter key.



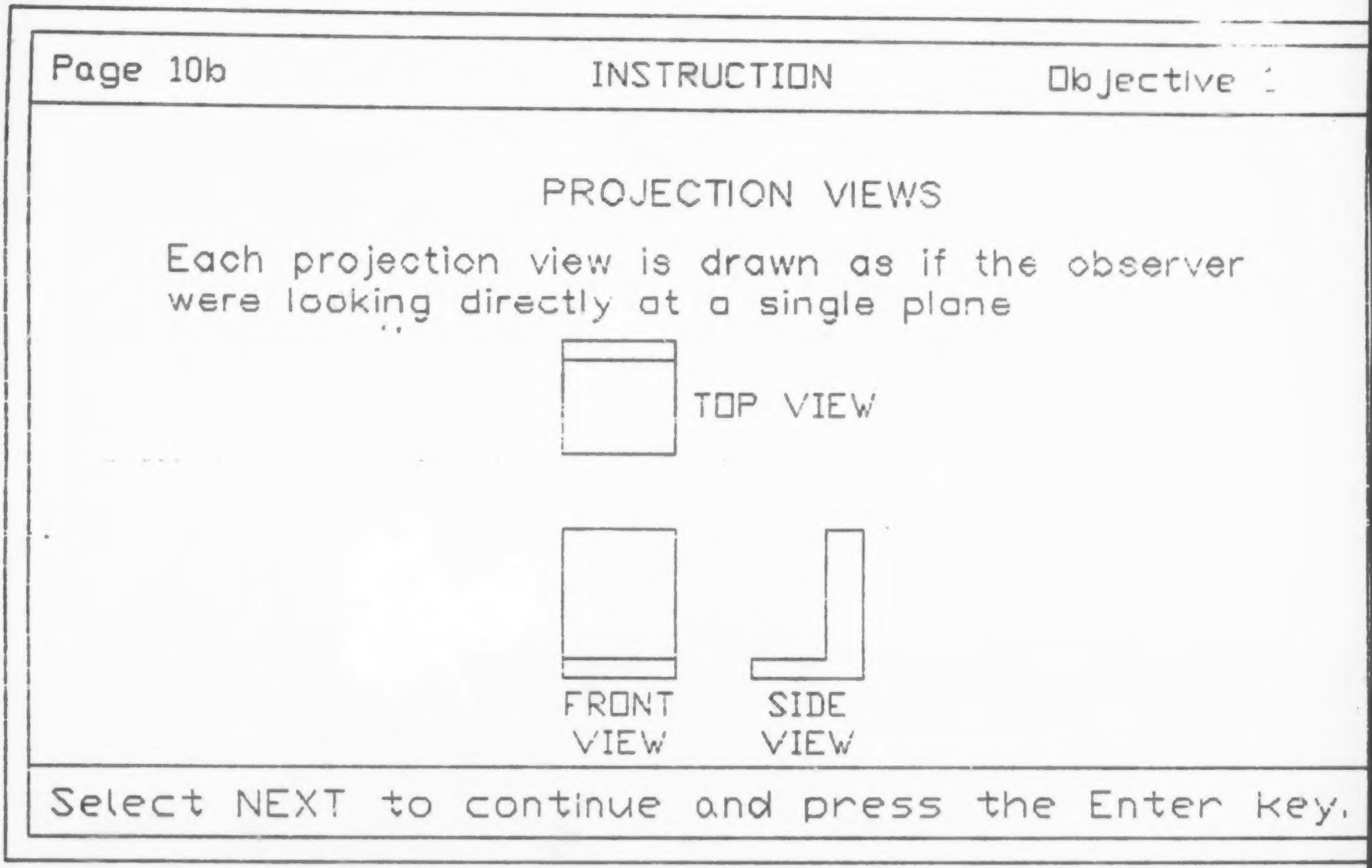
Page 10a INSTRUCTION Objective 1

PROJECTION VIEWS

Each projection view is drawn as if the observer were looking directly at a single plane.

Top plane
Side plane
Front plane

Select MORE INFO or NEXT to continue and press the Enter key.



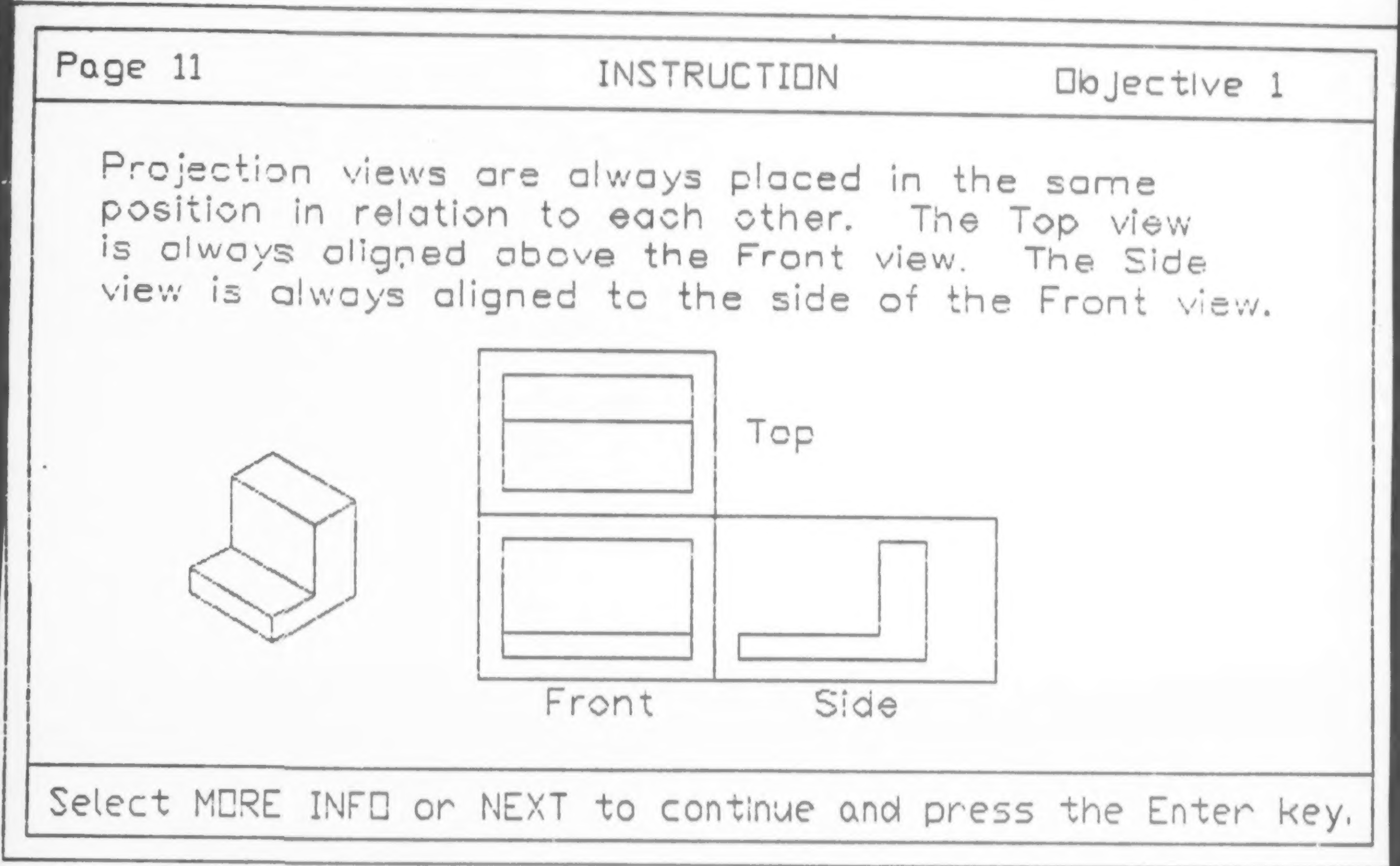
Page 10b INSTRUCTION Objective 1

PROJECTION VIEWS

Each projection view is drawn as if the observer were looking directly at a single plane

TOP VIEW
FRONT VIEW
SIDE VIEW

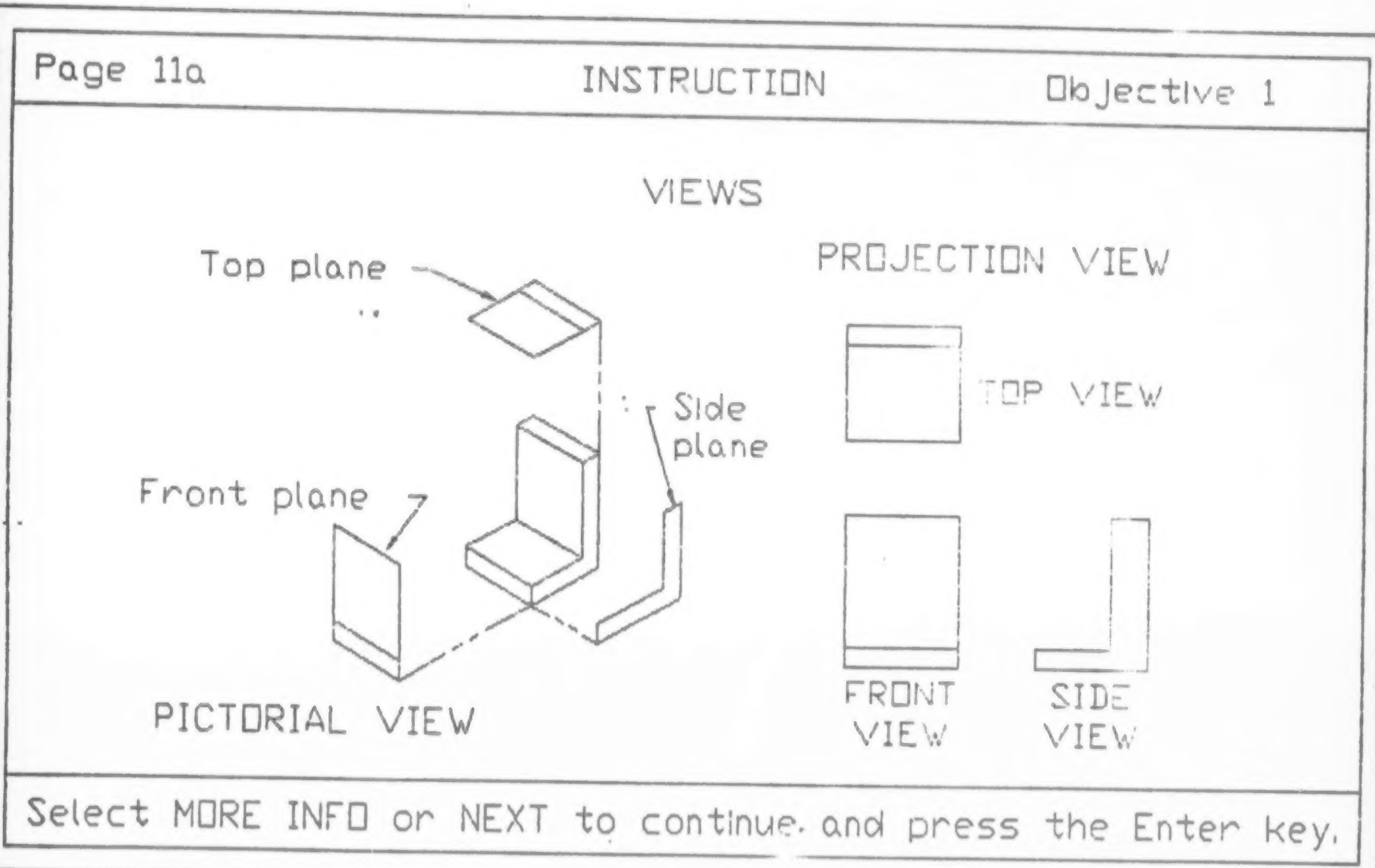
Select NEXT to continue and press the Enter key.



Page 11 INSTRUCTION Objective 1

Projection views are always placed in the same position in relation to each other. The Top view is always aligned above the Front view. The Side view is always aligned to the side of the Front view.

Select MORE INFO or NEXT to continue and press the Enter key.

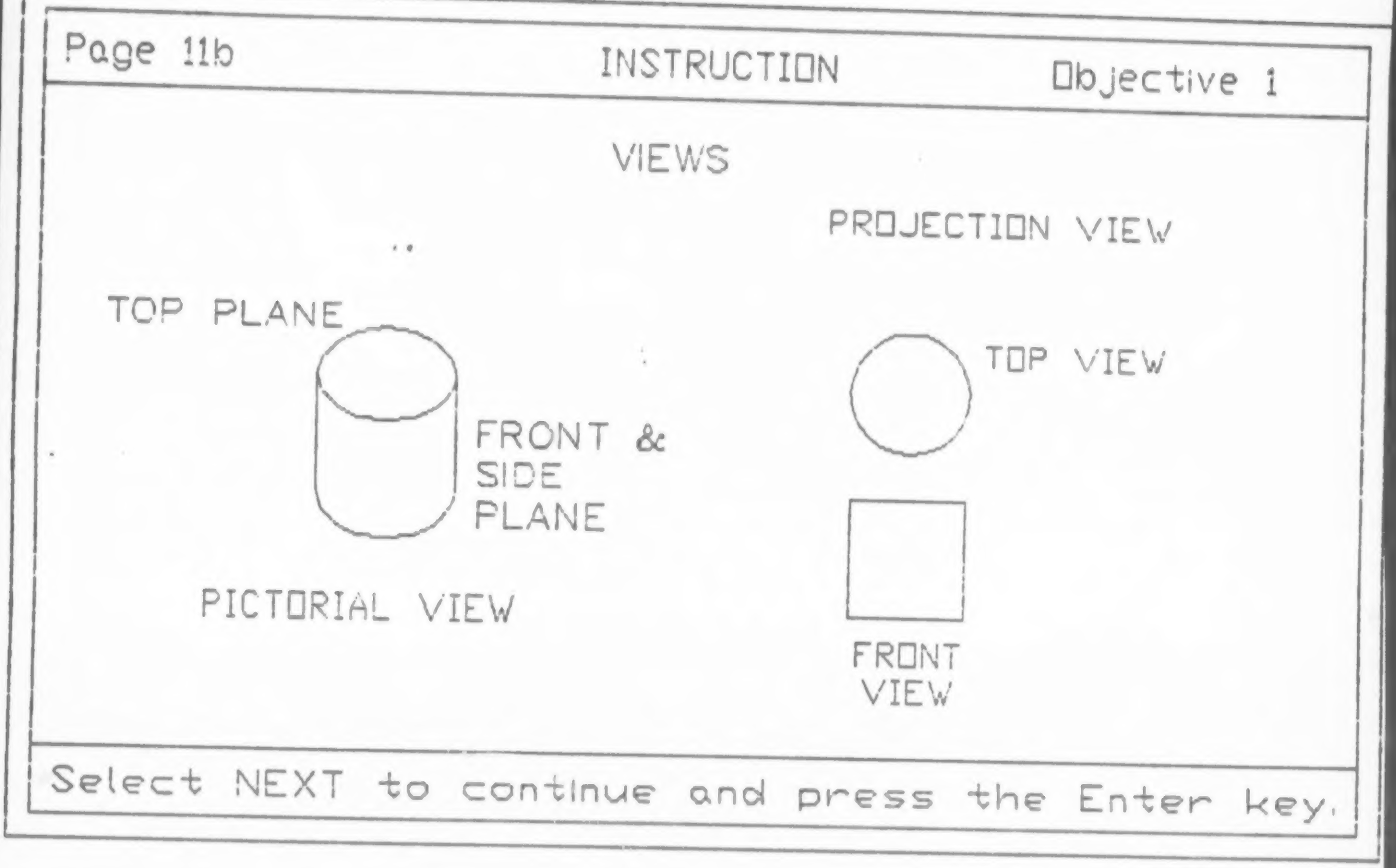


Page 11a INSTRUCTION Objective 1

VIEWS

Top plane
Side plane
Front plane
PICTORIAL VIEW
PROJECTION VIEW
TOP VIEW
FRONT VIEW
SIDE VIEW

Select MORE INFO or NEXT to continue. and press the Enter key.

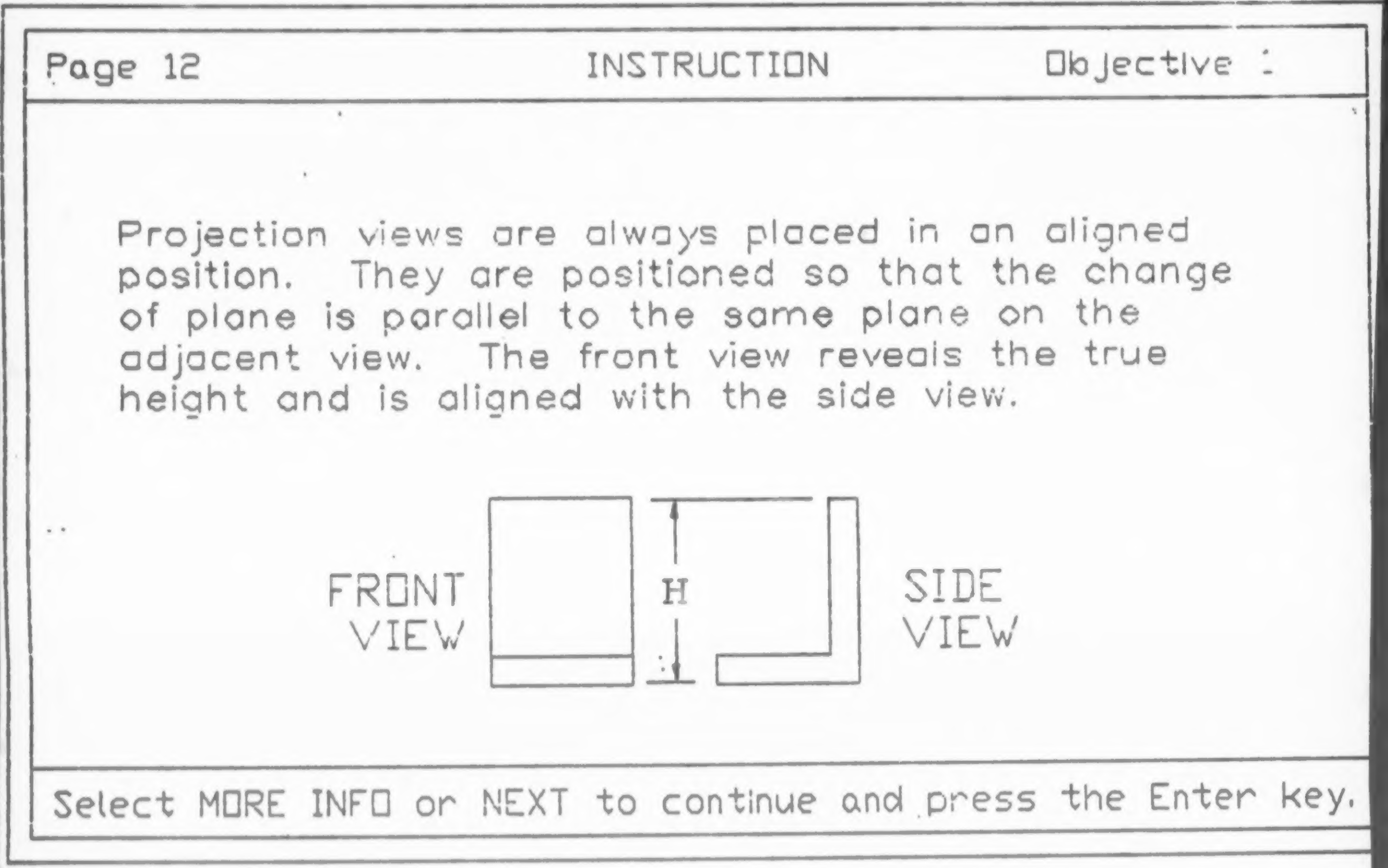


Page 11b INSTRUCTION Objective 1

VIEWS

PROJECTION VIEW
TOP PLANE
TOP VIEW
FRONT &
SIDE
PLANE
PICTORIAL VIEW
FRONT
VIEW

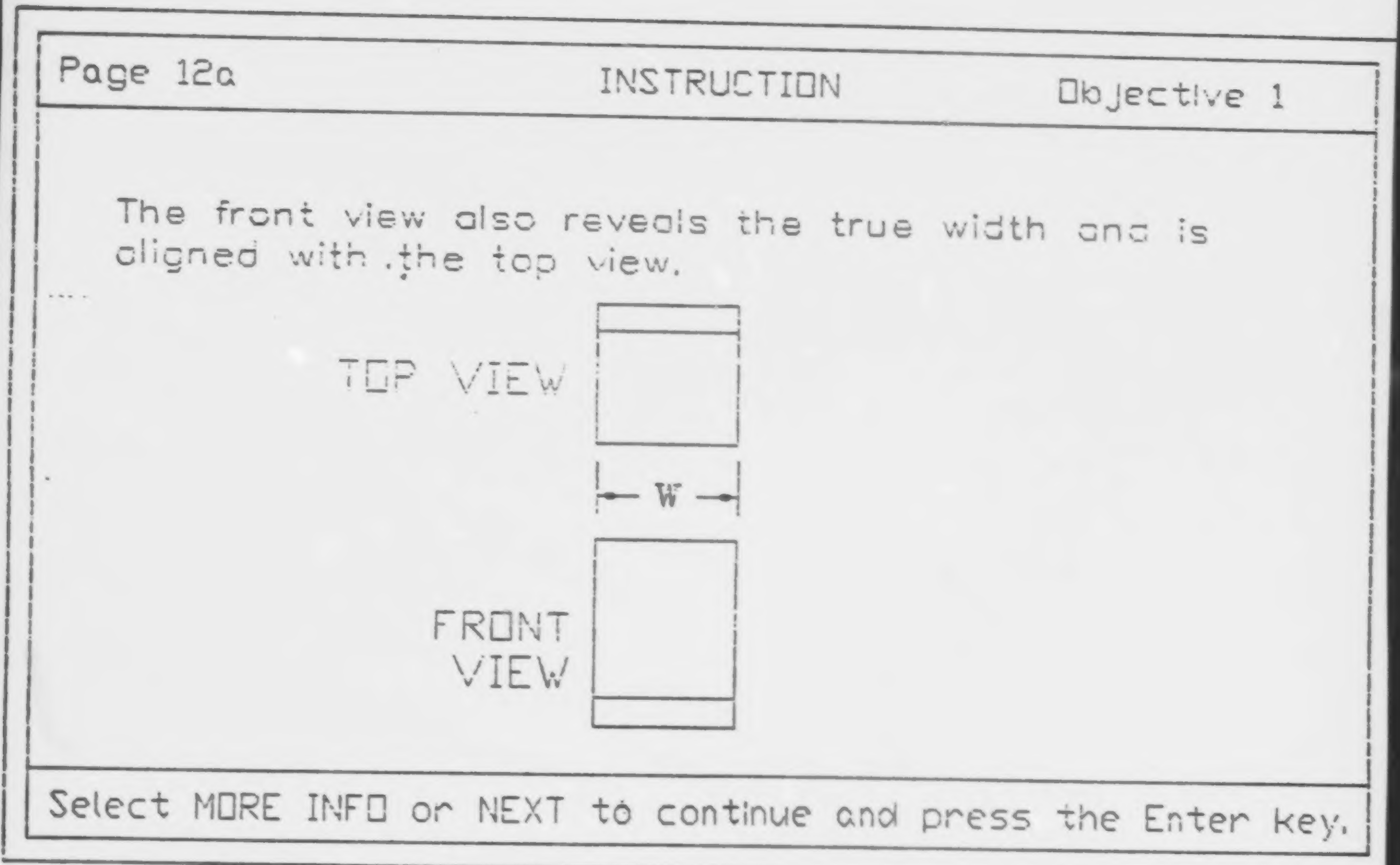
Select NEXT to continue and press the Enter key.



Page 12 INSTRUCTION Objective

Projection views are always placed in an aligned position. They are positioned so that the change of plane is parallel to the same plane on the adjacent view. The front view reveals the true height and is aligned with the side view.

Select MORE INFO or NEXT to continue and press the Enter key.

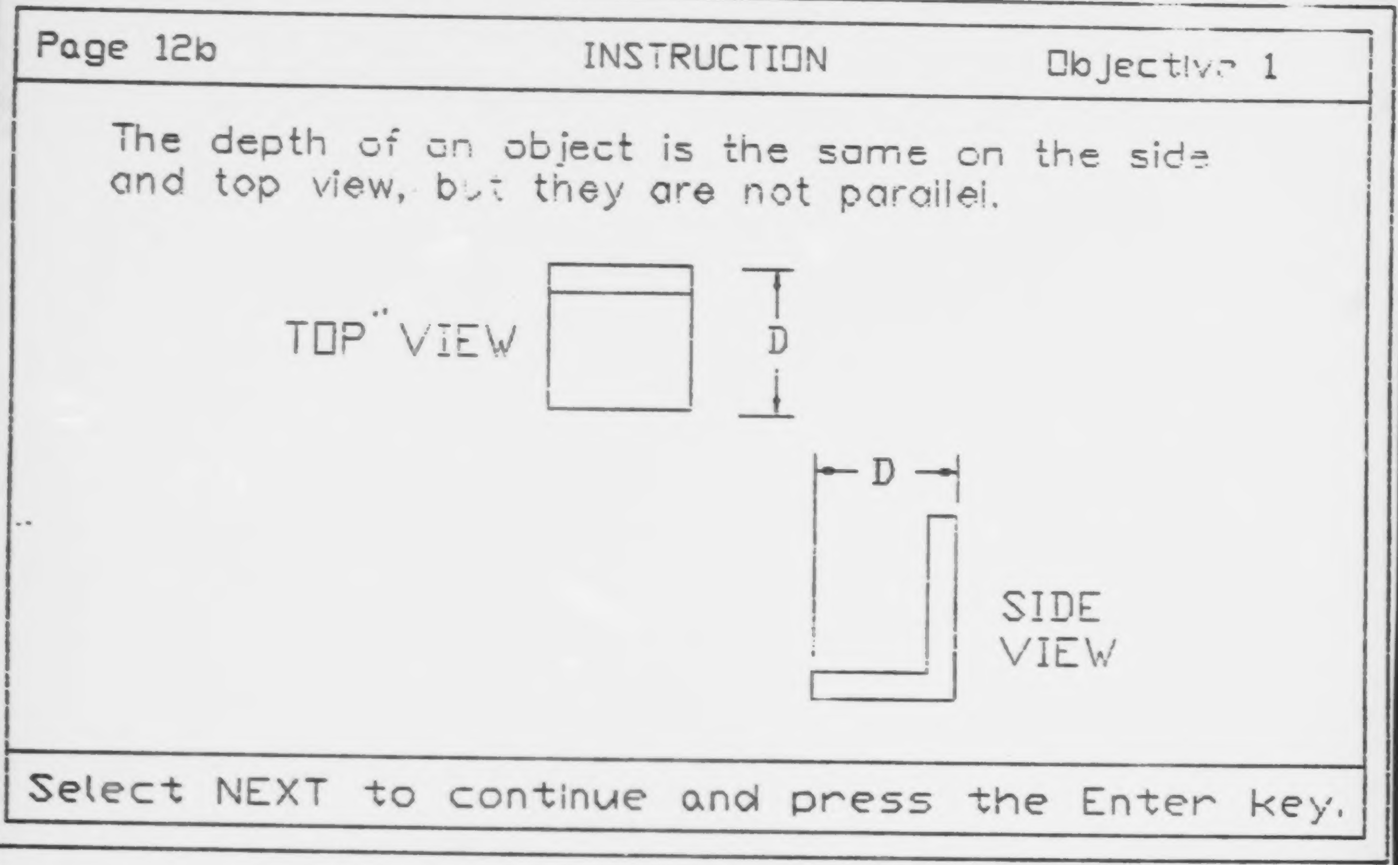


Page 12a INSTRUCTION Objective 1

The front view also reveals the true width and is aligned with the top view.

TOP VIEW
W
FRONT VIEW

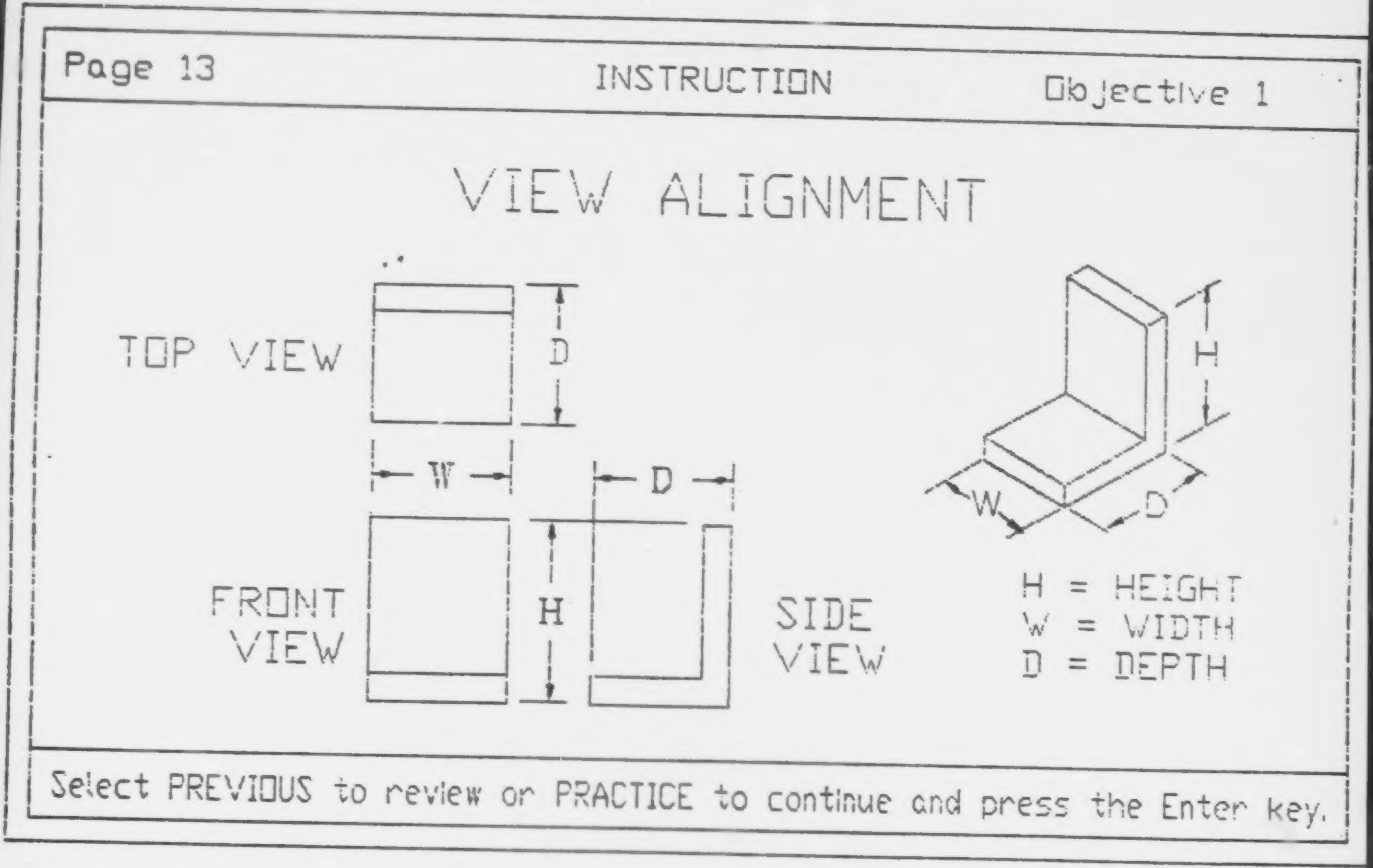
Select MORE INFO or NEXT to continue and press the Enter key.


TOP VIEW
D
D
SIDE VIEW

Page 12b INSTRUCTION Objective 1

The depth of an object is the same on the side and top view, but they are not parallel.

Select NEXT to continue and press the Enter key.



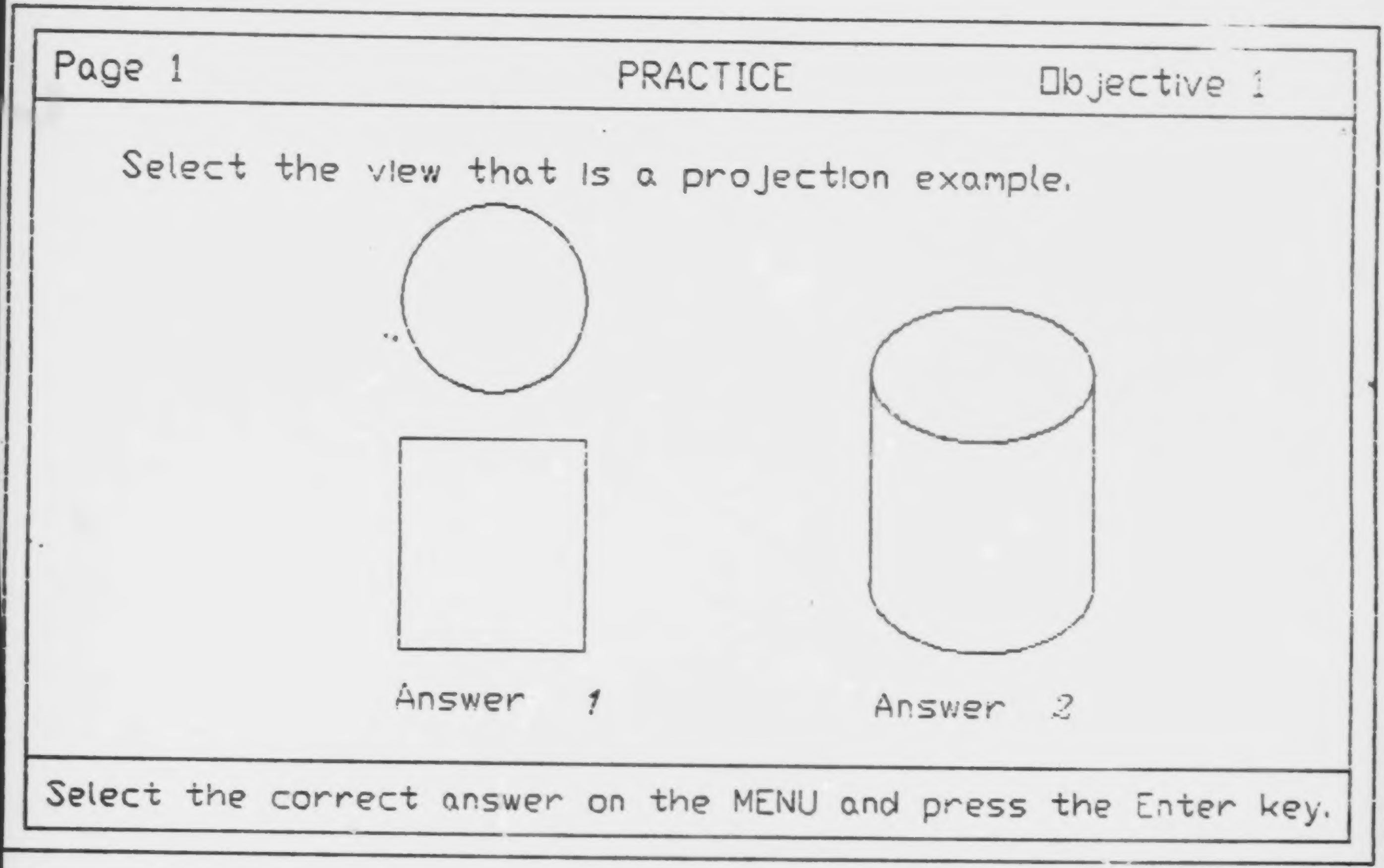
Page 13 INSTRUCTION Objective 1

VIEW ALIGNMENT

TOP VIEW
D
W
D
FRONT VIEW
H
SIDE VIEW
H
W
D

H = HEIGHT
W = WIDTH
D = DEPTH

Select PREVIOUS to review or PRACTICE to continue and press the Enter key.

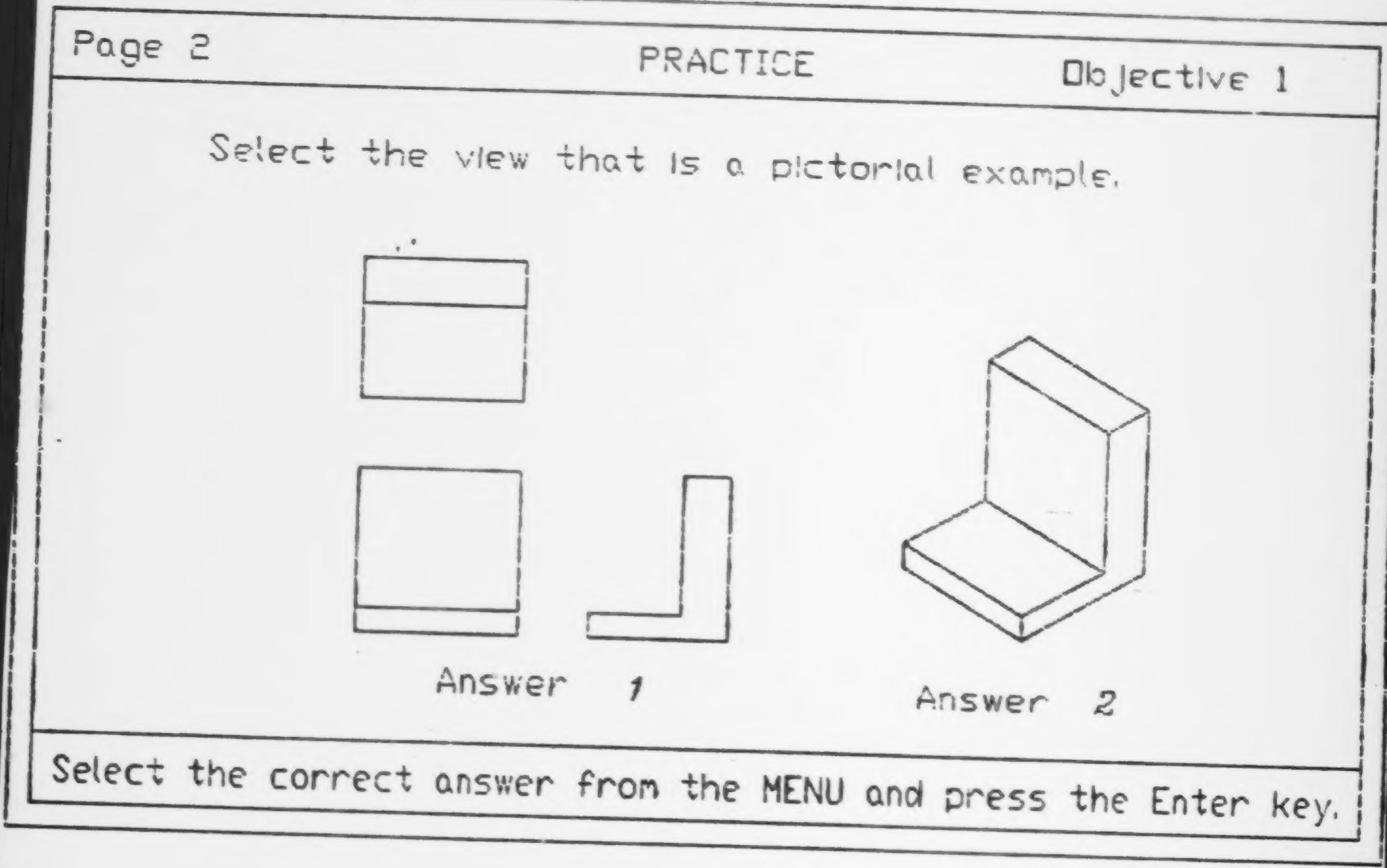


Page 1 PRACTICE Objective 1

Select the view that is a projection example.

Answer 1
Answer 2

Select the correct answer on the MENU and press the Enter key.



Page 2

PRACTICE

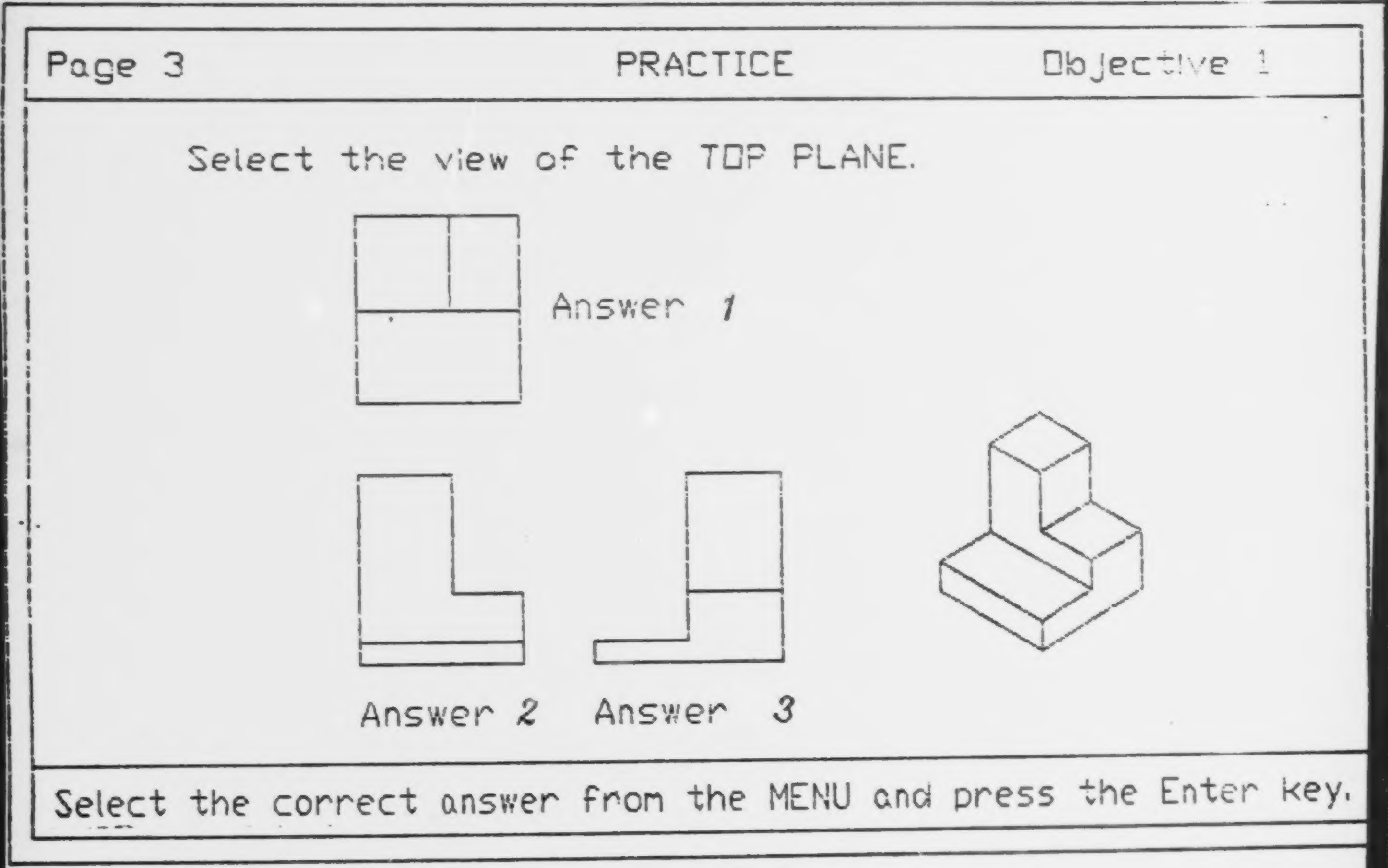
Objective 1

Select the view that is a pictorial example.

Answer 1

Answer 2

Select the correct answer from the MENU and press the Enter key.

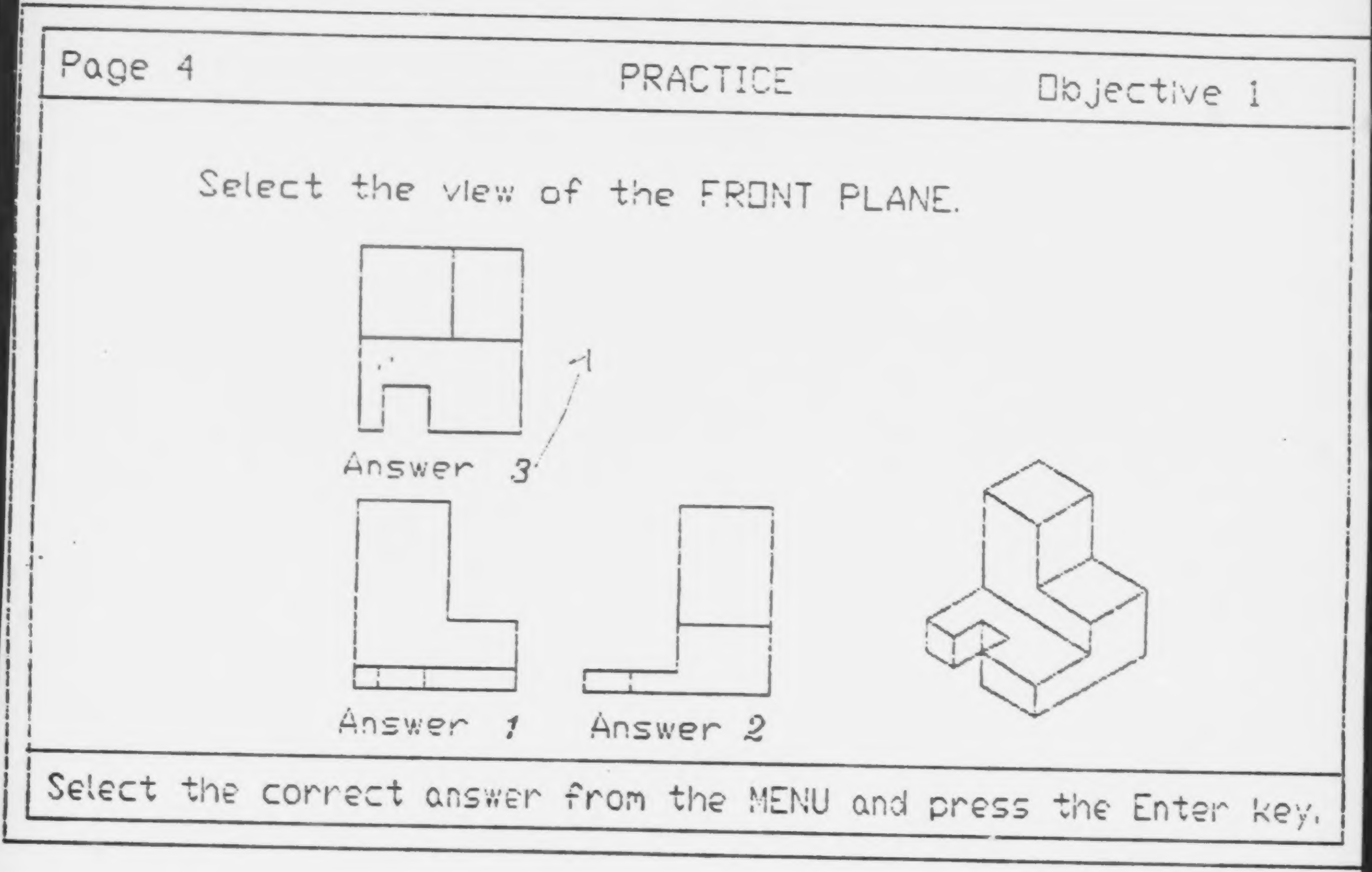


Page 3 PRACTICE Objective 1

Select the view of the TOP PLANE.

Answer 1
Answer 2
Answer 3

Select the correct answer from the MENU and press the Enter key.

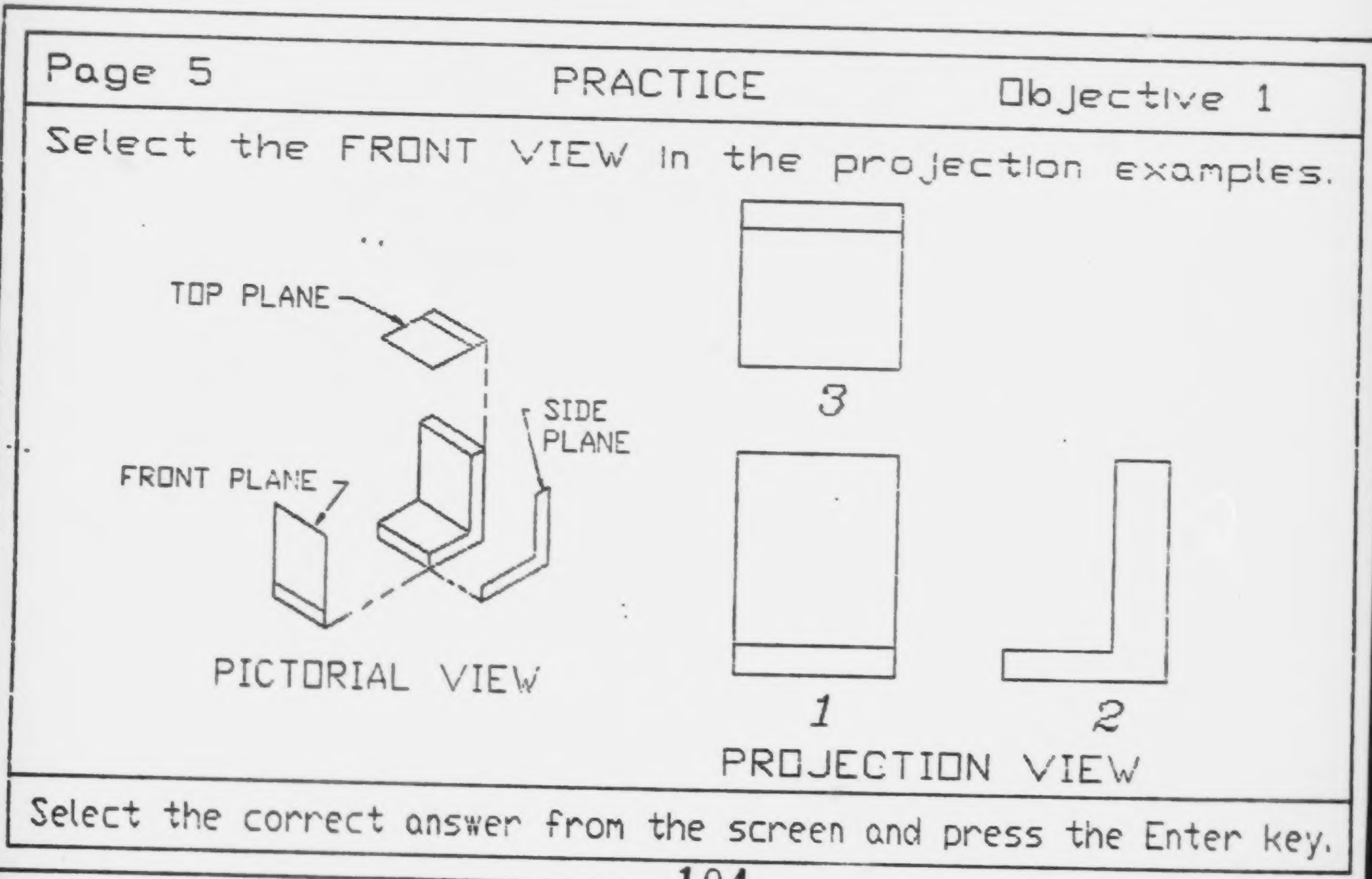


Page 4 PRACTICE Objective 1

Select the view of the FRONT PLANE.

Answer 3
1
Answer 1
Answer 2

Select the correct answer from the MENU and press the Enter key.

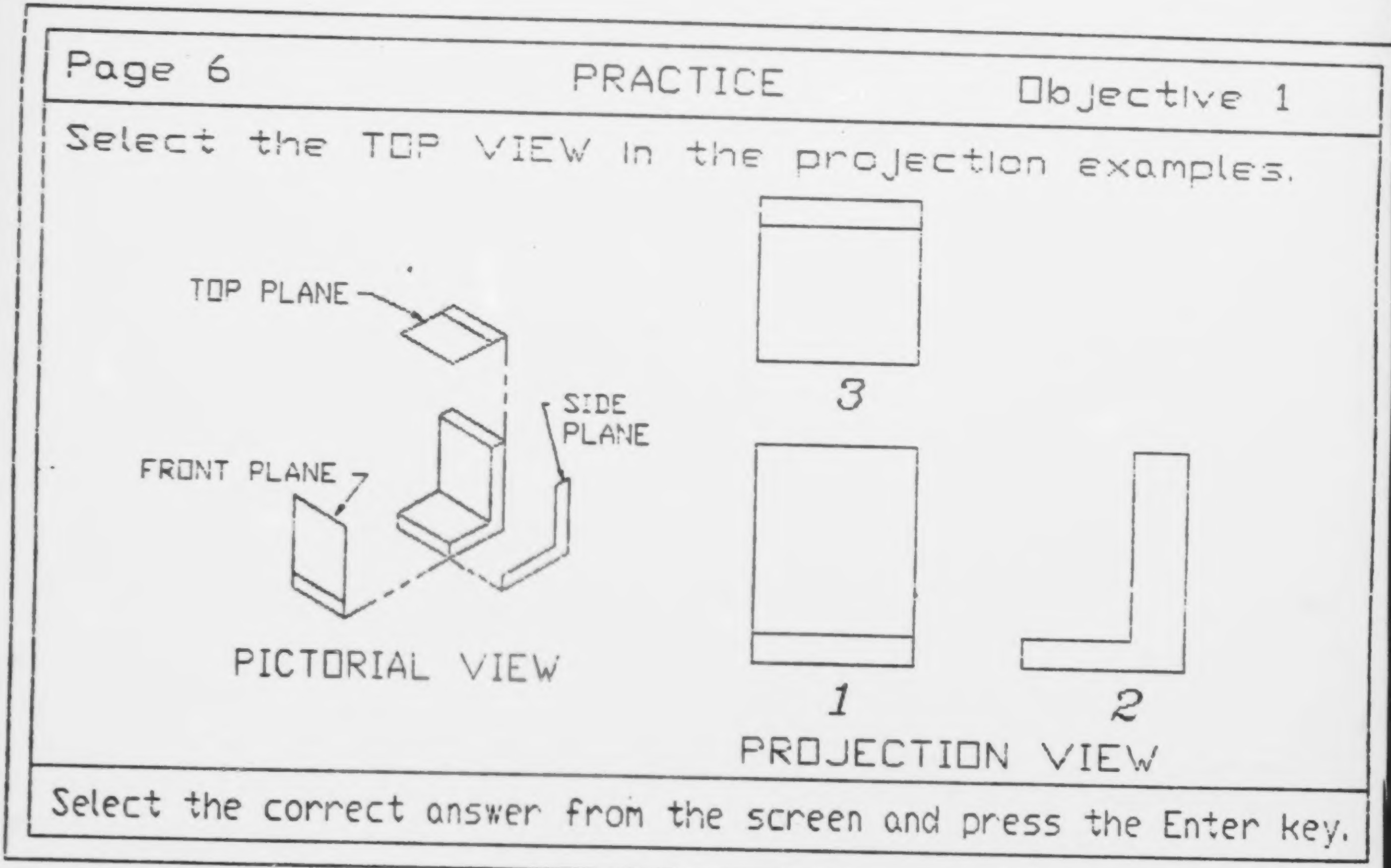


Page 5 PRACTICE Objective 1

Select the FRONT VIEW in the projection examples.

TOP PLANE
SIDE PLANE
FRONT PLANE
PICTORIAL VIEW
3
1
2
PROJECTION VIEW

Select the correct answer from the screen and press the Enter key.

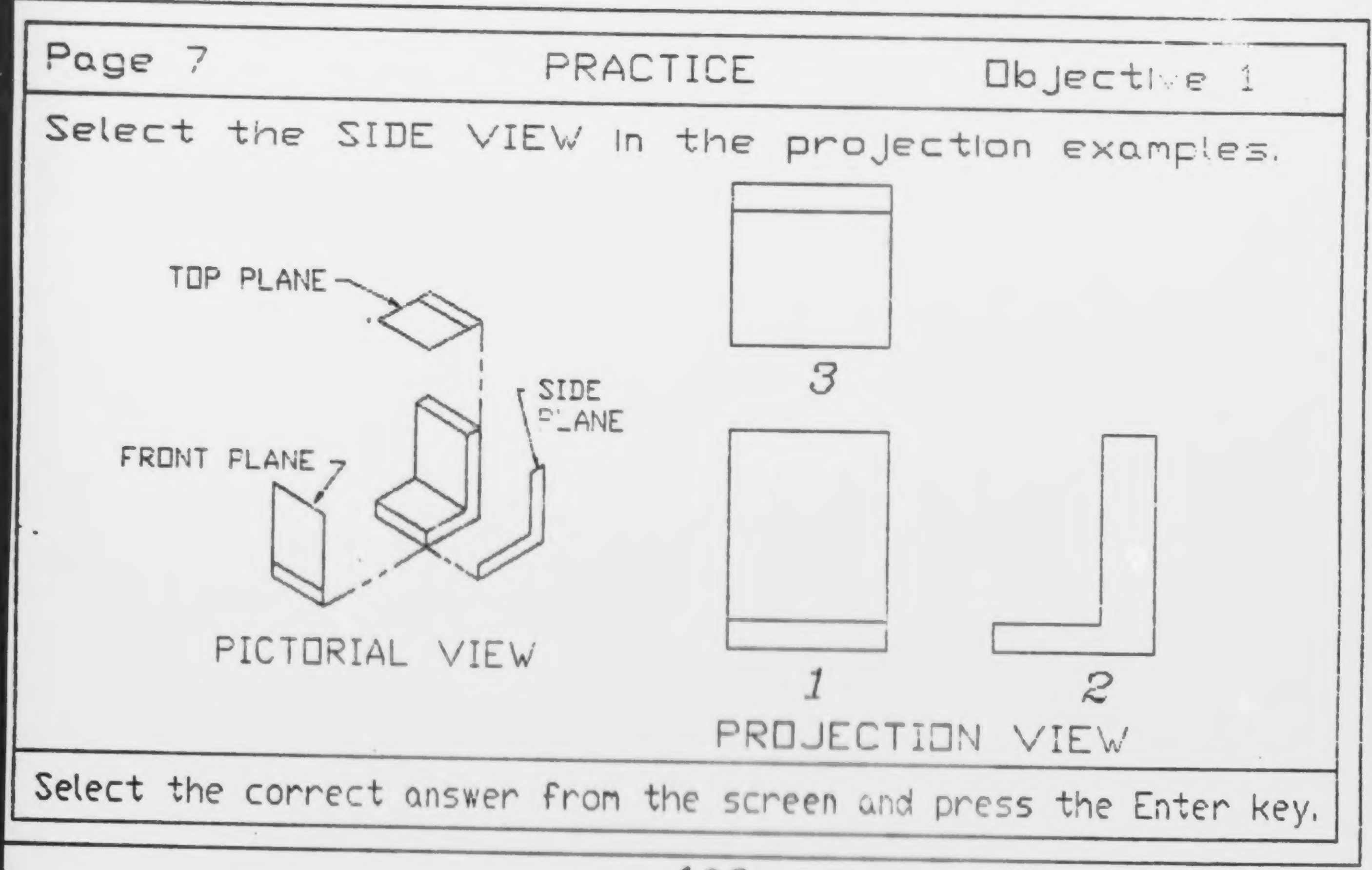


Page 6 PRACTICE Objective 1

Select the TOP VIEW in the projection examples.

TOP PLANE
SIDE PLANE
FRONT PLANE
PICTORIAL VIEW
3
1
2
PROJECTION VIEW

Select the correct answer from the screen and press the Enter key.

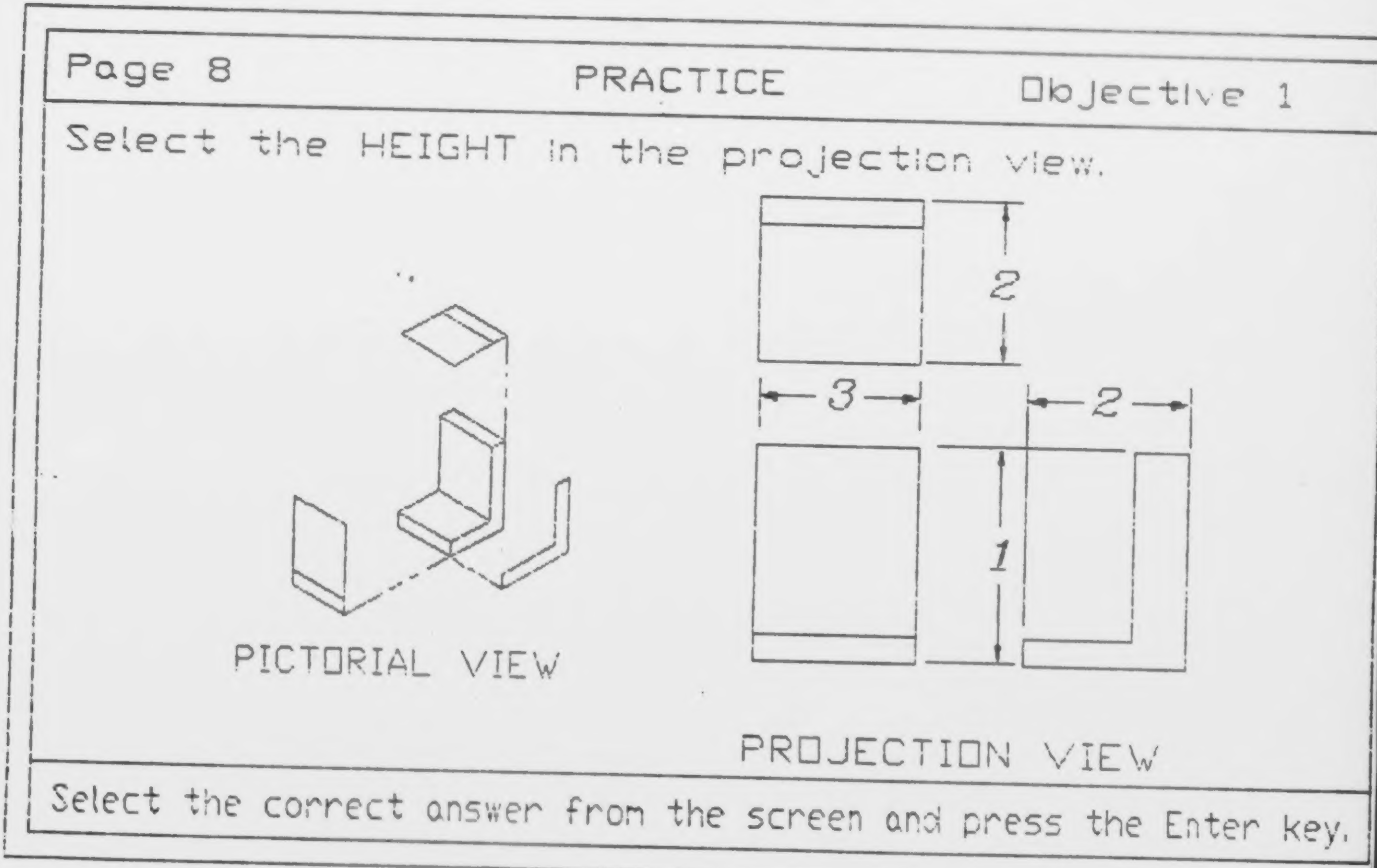


Page 7 PRACTICE Objective 1

Select the SIDE VIEW in the projection examples.

TOP PLANE
SIDE PLANE
FRONT PLANE
PICTORIAL VIEW
3
1
2
PROJECTION VIEW

Select the correct answer from the screen and press the Enter key.



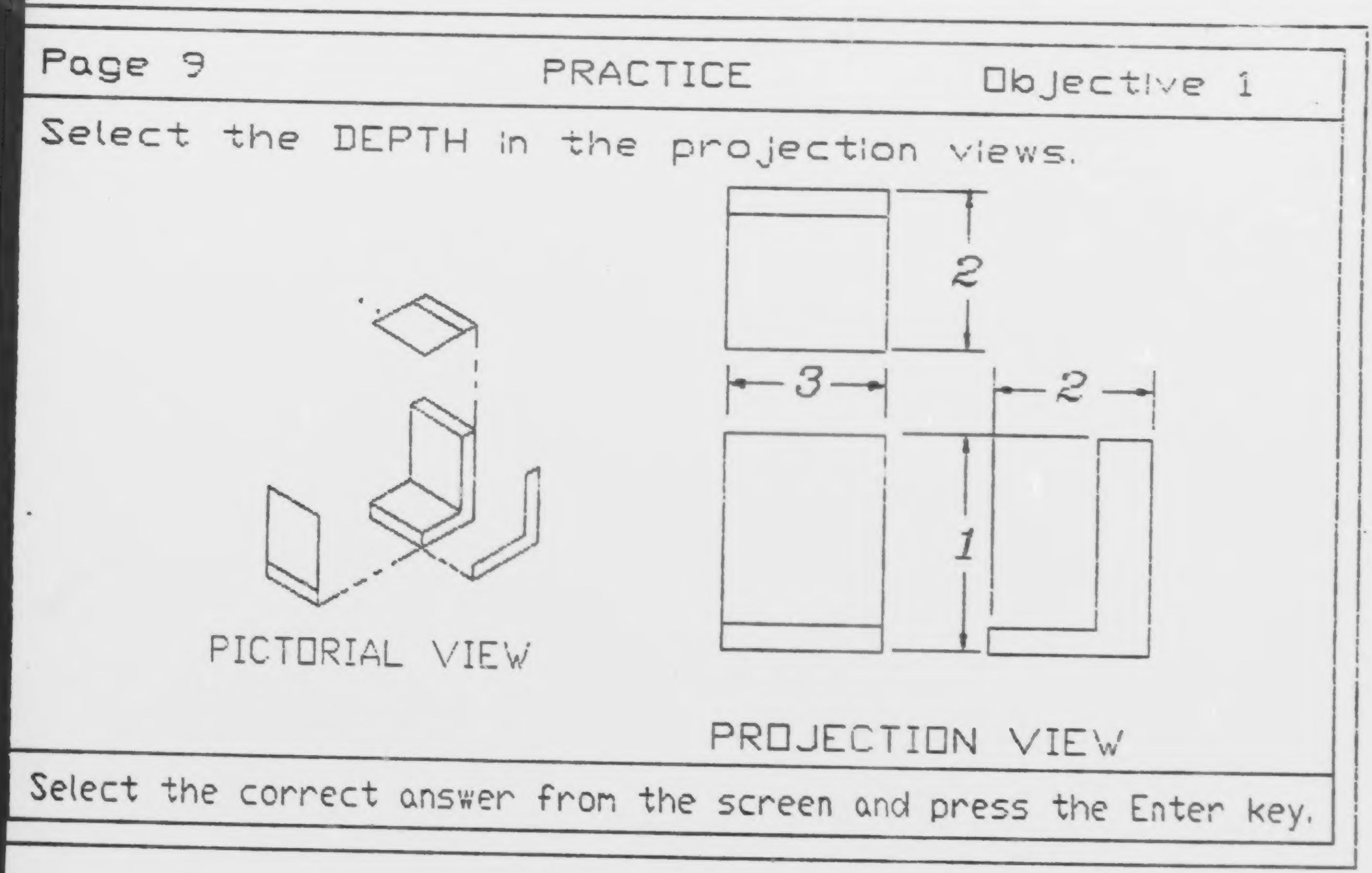
Page 8 PRACTICE Objective 1

Select the HEIGHT in the projection view.

PICTORIAL VIEW

PROJECTION VIEW

Select the correct answer from the screen and press the Enter key.



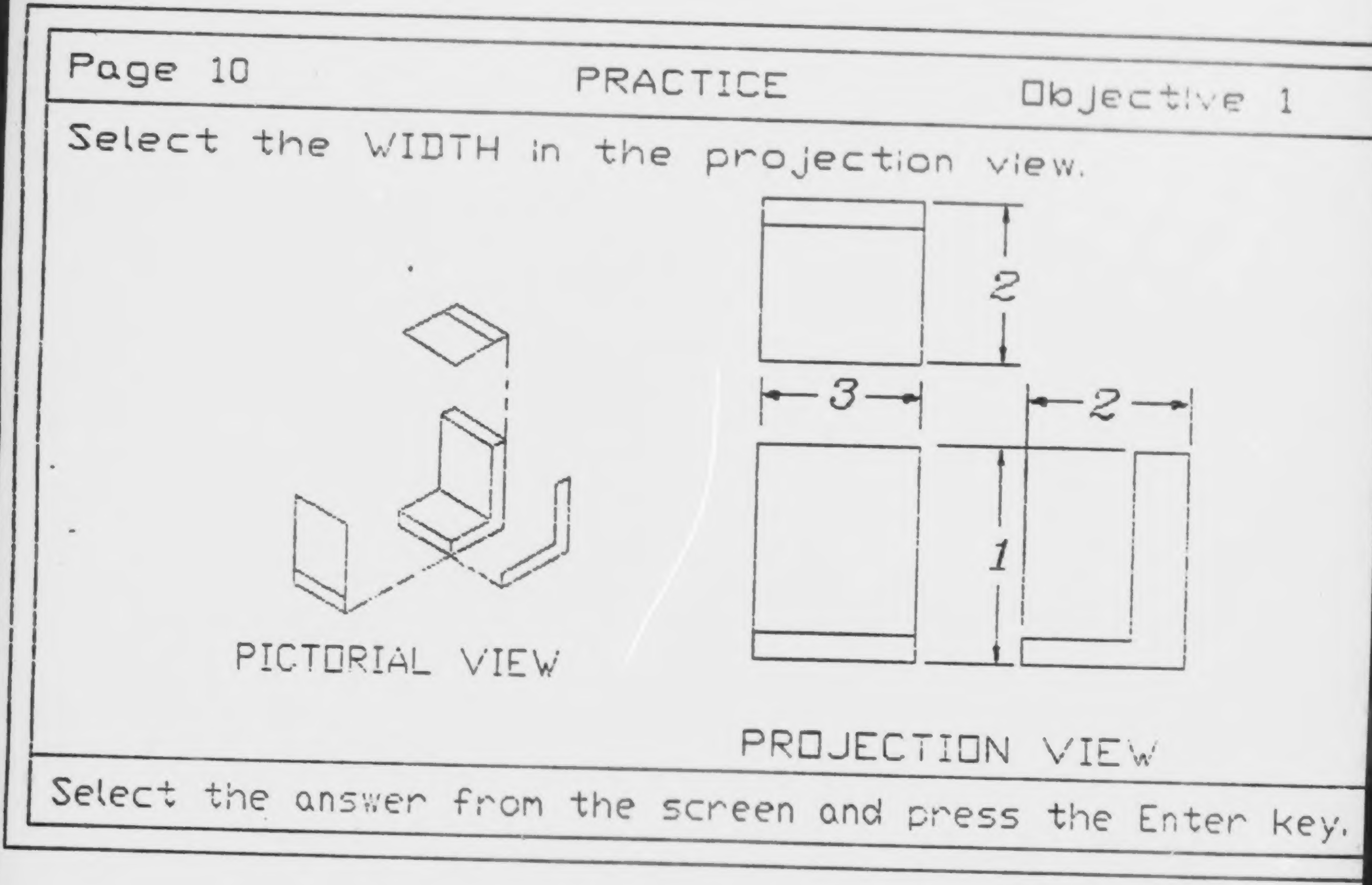
Page 9 PRACTICE Objective 1

Select the DEPTH in the projection views.

PICTORIAL VIEW

PROJECTION VIEW

Select the correct answer from the screen and press the Enter key.



Page 10 PRACTICE Objective 1

Select the WIDTH in the projection view.

PICTORIAL VIEW
2
3
2
1
PROJECTION VIEW

Select the answer from the screen and press the Enter key.

TEXAS STATE TECHNICAL INSTITUTE

TSTI WACO

PRESENTS

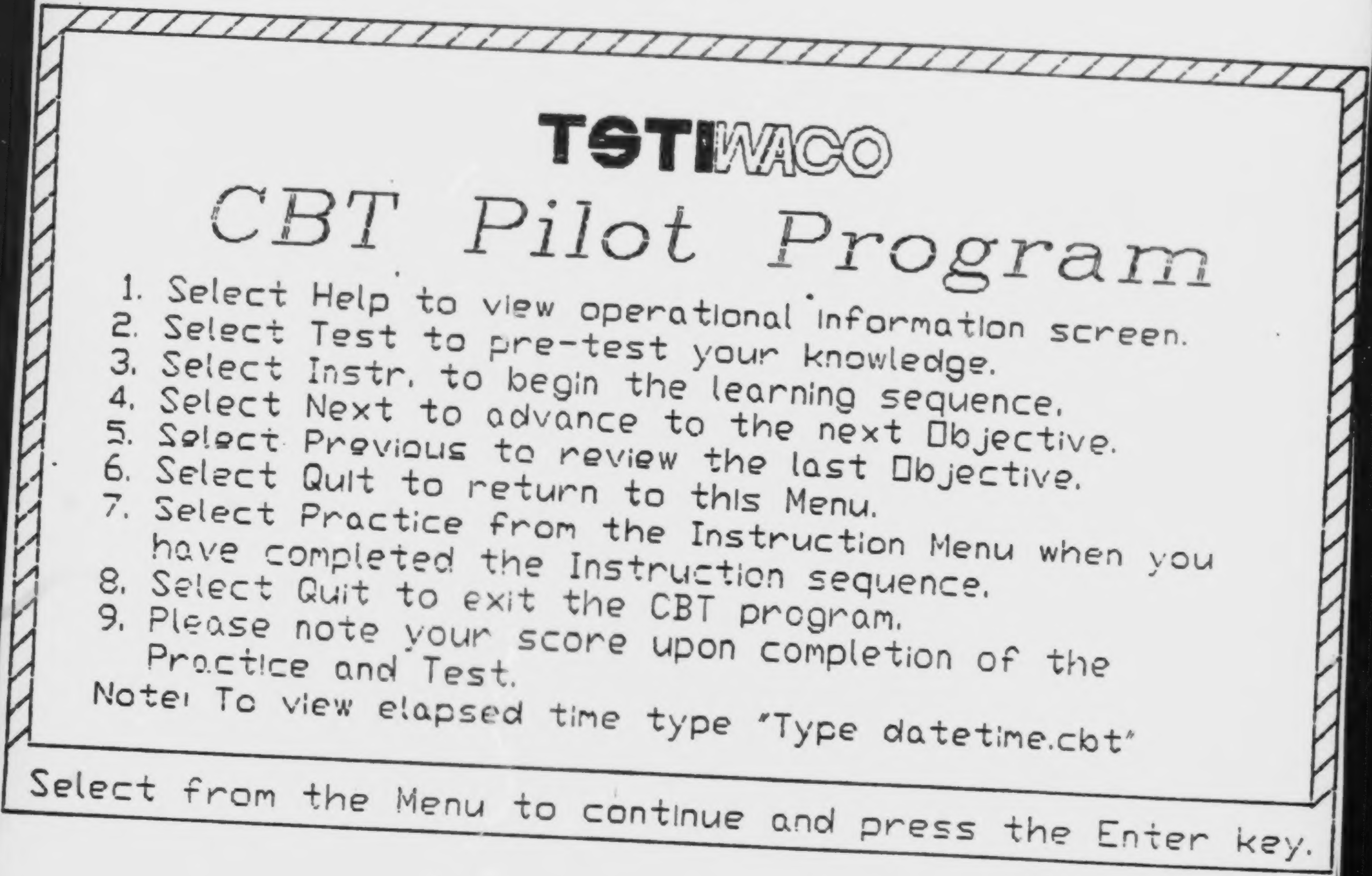
A

CBT Pilot Program

Designed by Mardelle A. Sauer

Through a grant by the Coordinating Board

Texas College & University System



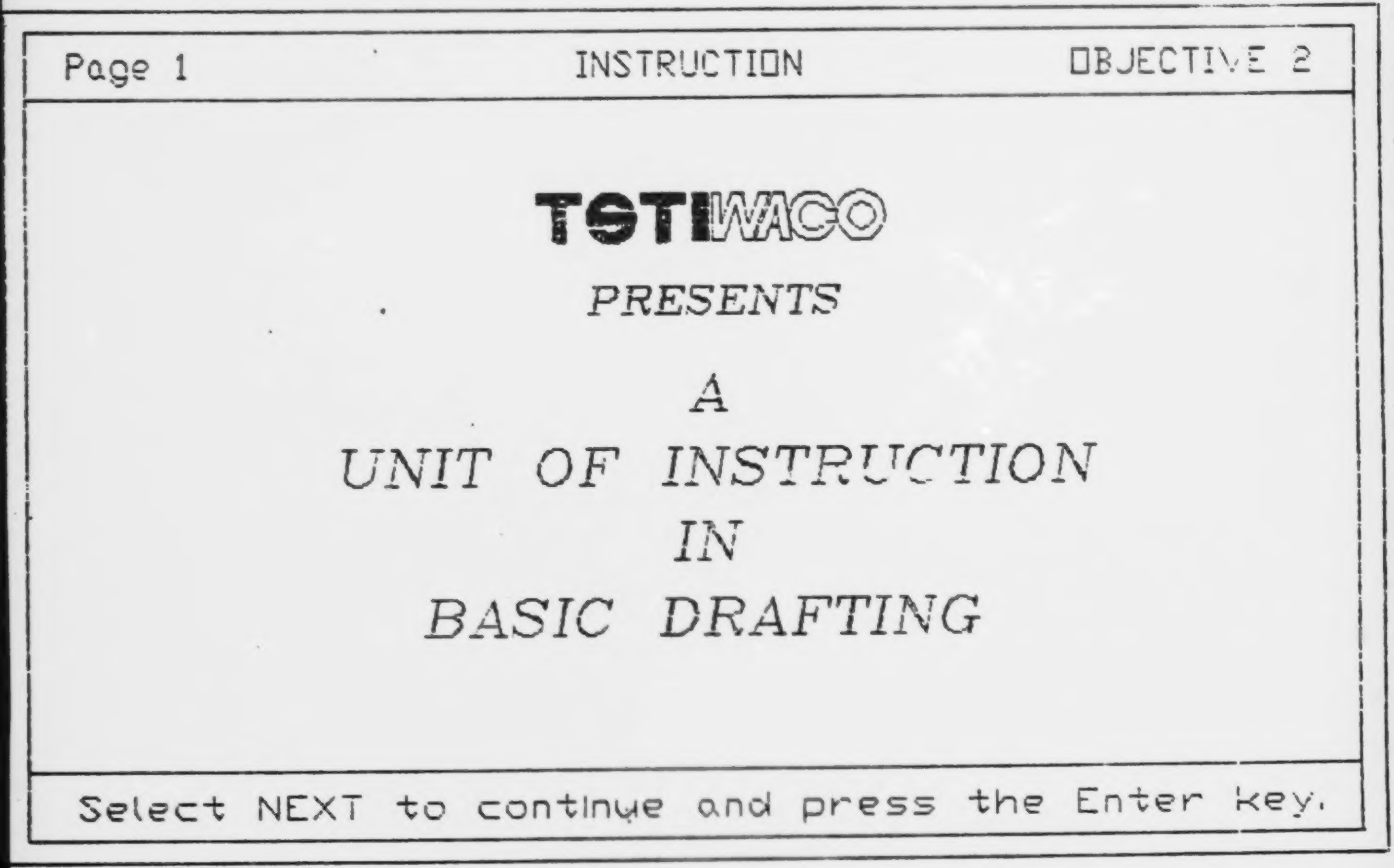
TSTI WACO

CBT Pilot Program

1. Select Help to view operational information screen.
2. Select Test to pre-test your knowledge.
3. Select Instr. to begin the learning sequence.
4. Select Next to advance to the next Objective.
5. Select Previous to review the last Objective.
6. Select Quit to return to this Menu.
7. Select Practice from the Instruction Menu when you have completed the Instruction sequence.
8. Select Quit to exit the CBT program.
9. Please note your score upon completion of the Practice and Test.

Note: To view elapsed time type "Type datetime.cbt"

Select from the Menu to continue and press the Enter key.



Page 1 INSTRUCTION OBJECTIVE 2

TSTI WACO

PRESENTS

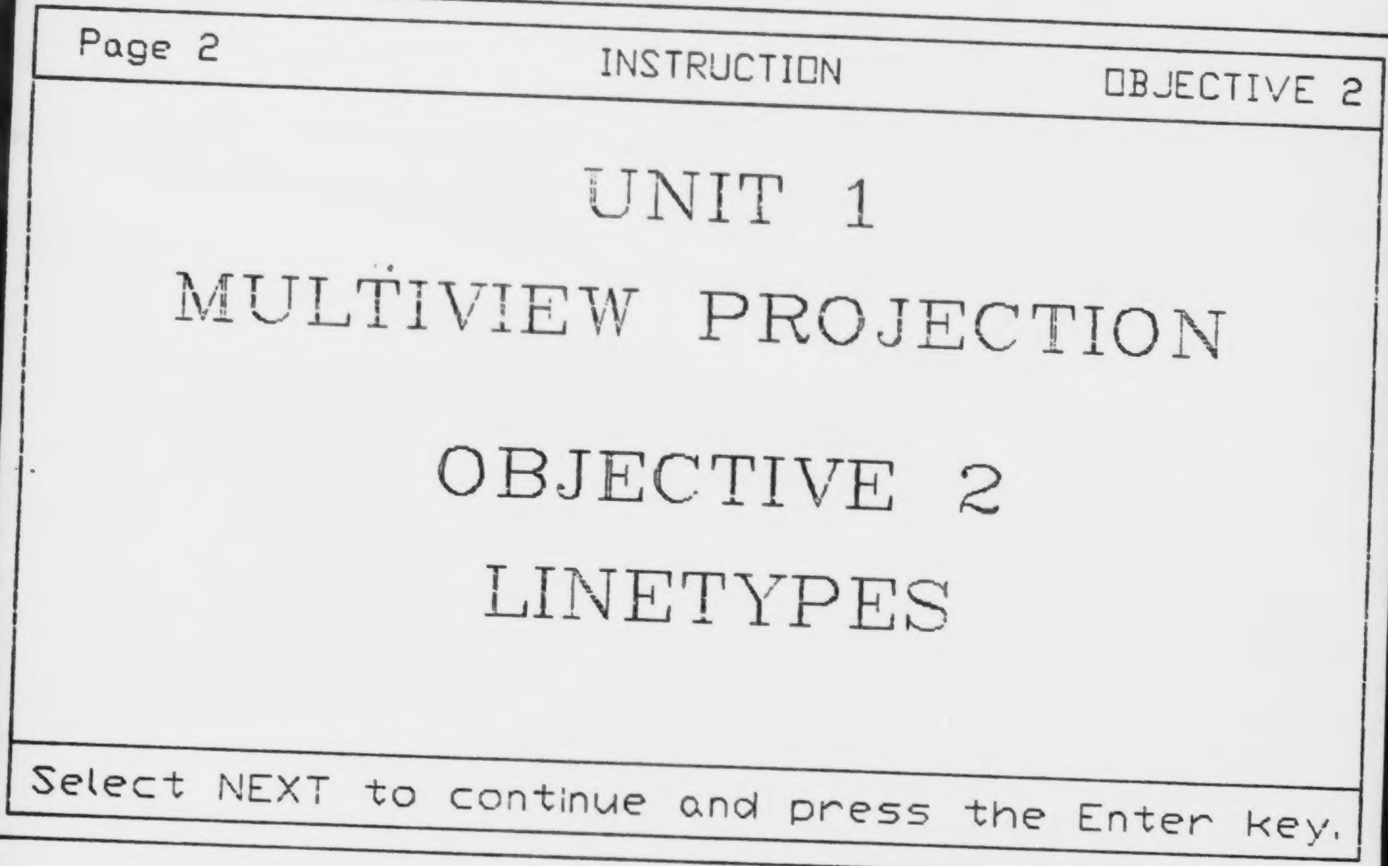
A

UNIT OF INSTRUCTION

IN

BASIC DRAFTING

Select NEXT to continue and press the Enter key.



Page 2 INSTRUCTION OBJECTIVE 2

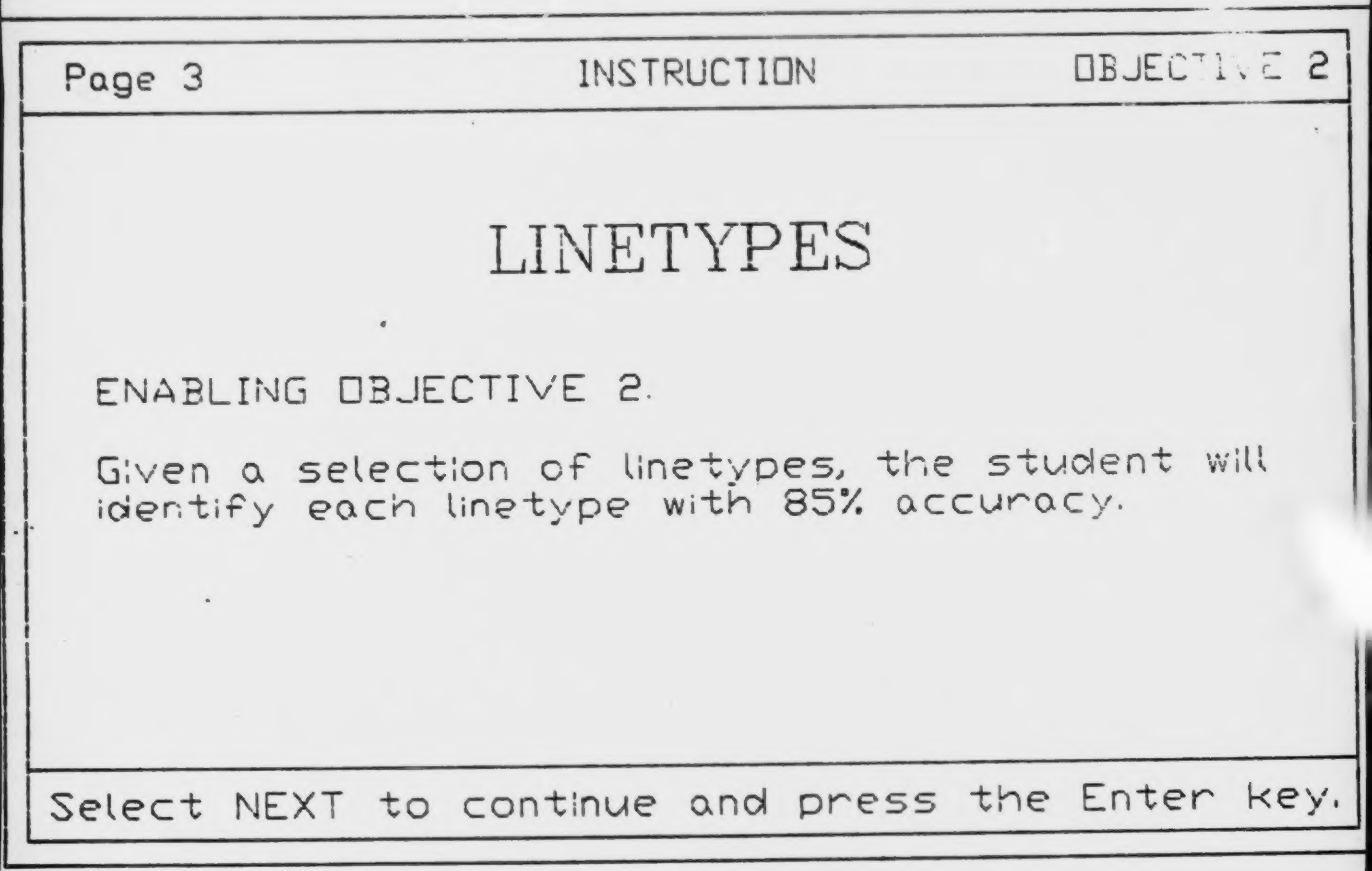
UNIT 1

MULTIVIEW PROJECTION

OBJECTIVE 2

LINETYPES

Select NEXT to continue and press the Enter key.



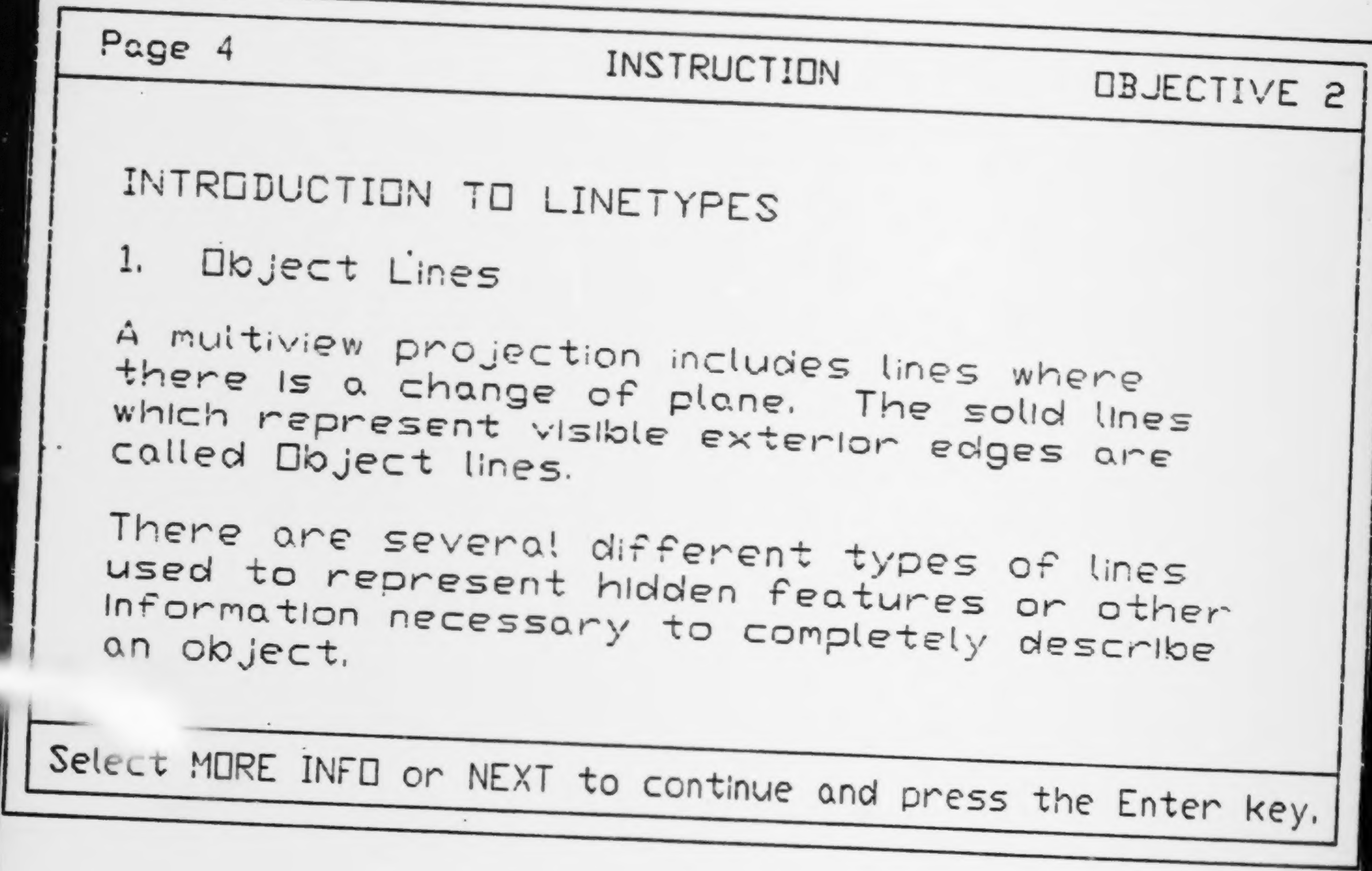
Page 3 INSTRUCTION OBJECTIVE 2

LINETYPES

ENABLING OBJECTIVE 2.

Given a selection of linetypes, the student will identify each linetype with 85% accuracy.

Select NEXT to continue and press the Enter key.



Page 4 INSTRUCTION OBJECTIVE 2

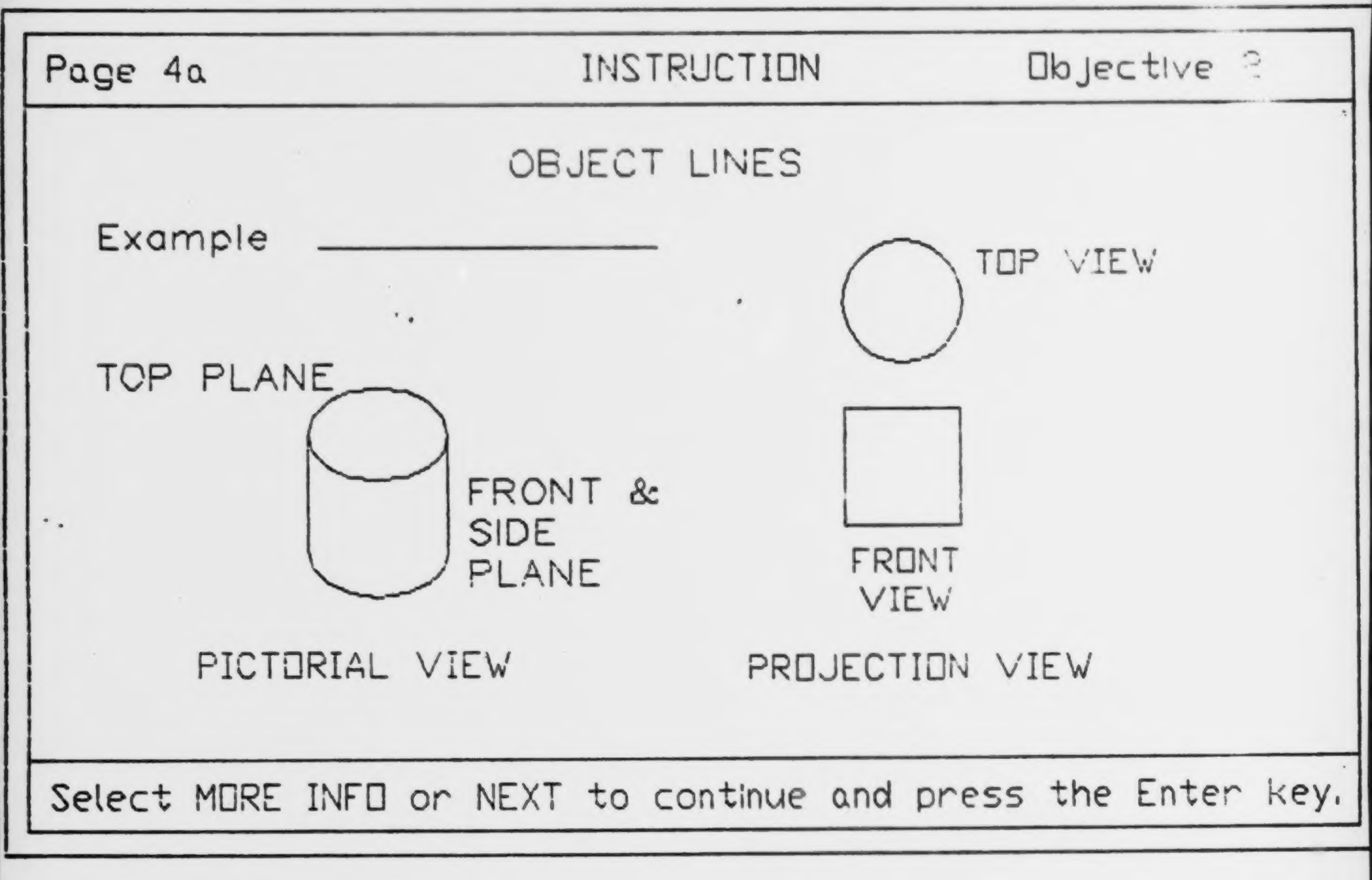
INTRODUCTION TO LINETYPES

1. Object Lines

A multiview projection includes lines where there is a change of plane. The solid lines which represent visible exterior edges are called Object lines.

There are several different types of lines used to represent hidden features or other information necessary to completely describe an object.

Select MORE INFO or NEXT to continue and press the Enter key.



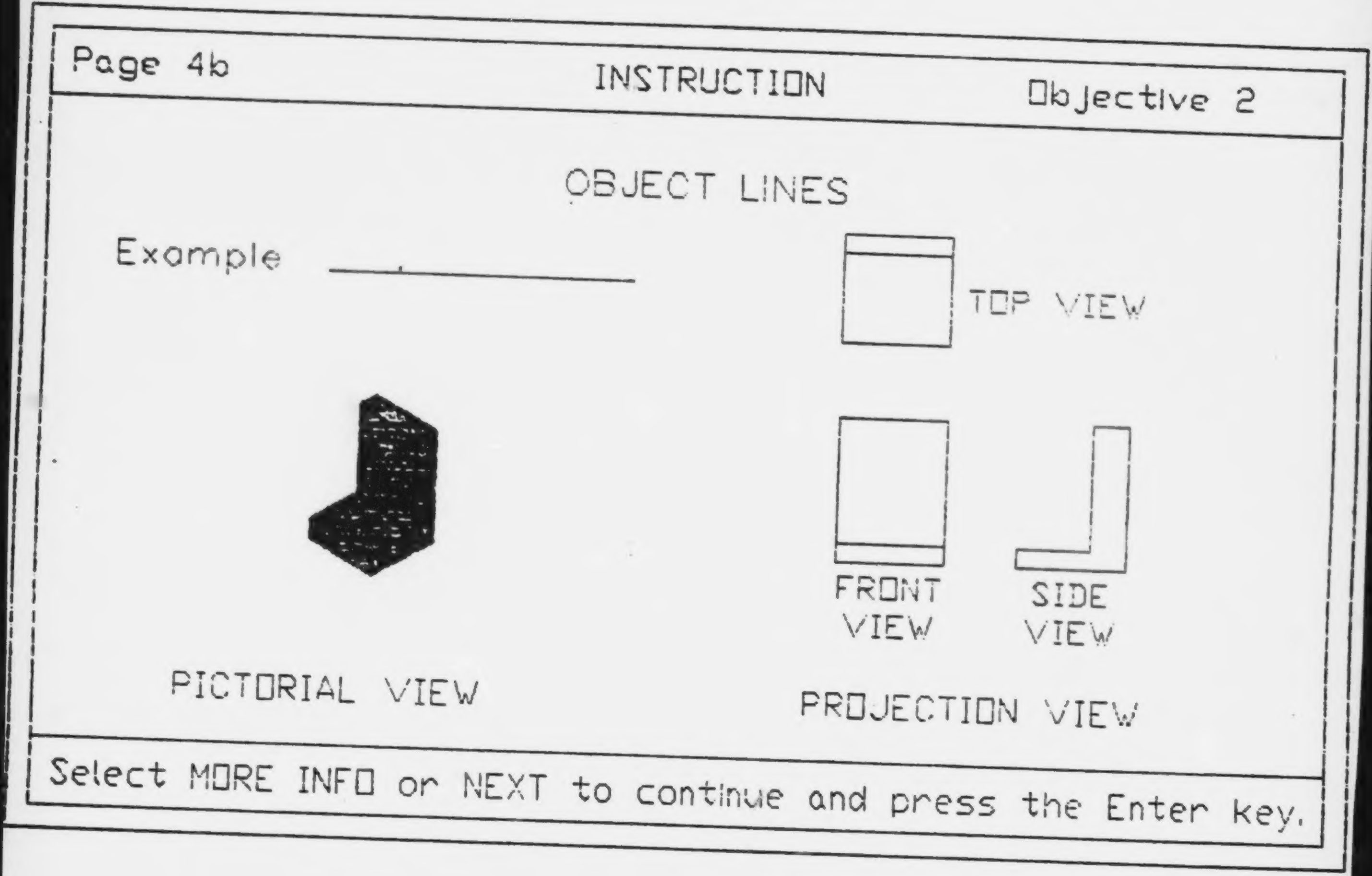
Page 4a INSTRUCTION Objective 2

OBJECT LINES

Example

TOP PLANE
FRONT & SIDE PLANE
TOP VIEW
FRONT VIEW
PICTORIAL VIEW
PROJECTION VIEW

Select MORE INFO or NEXT to continue and press the Enter key.



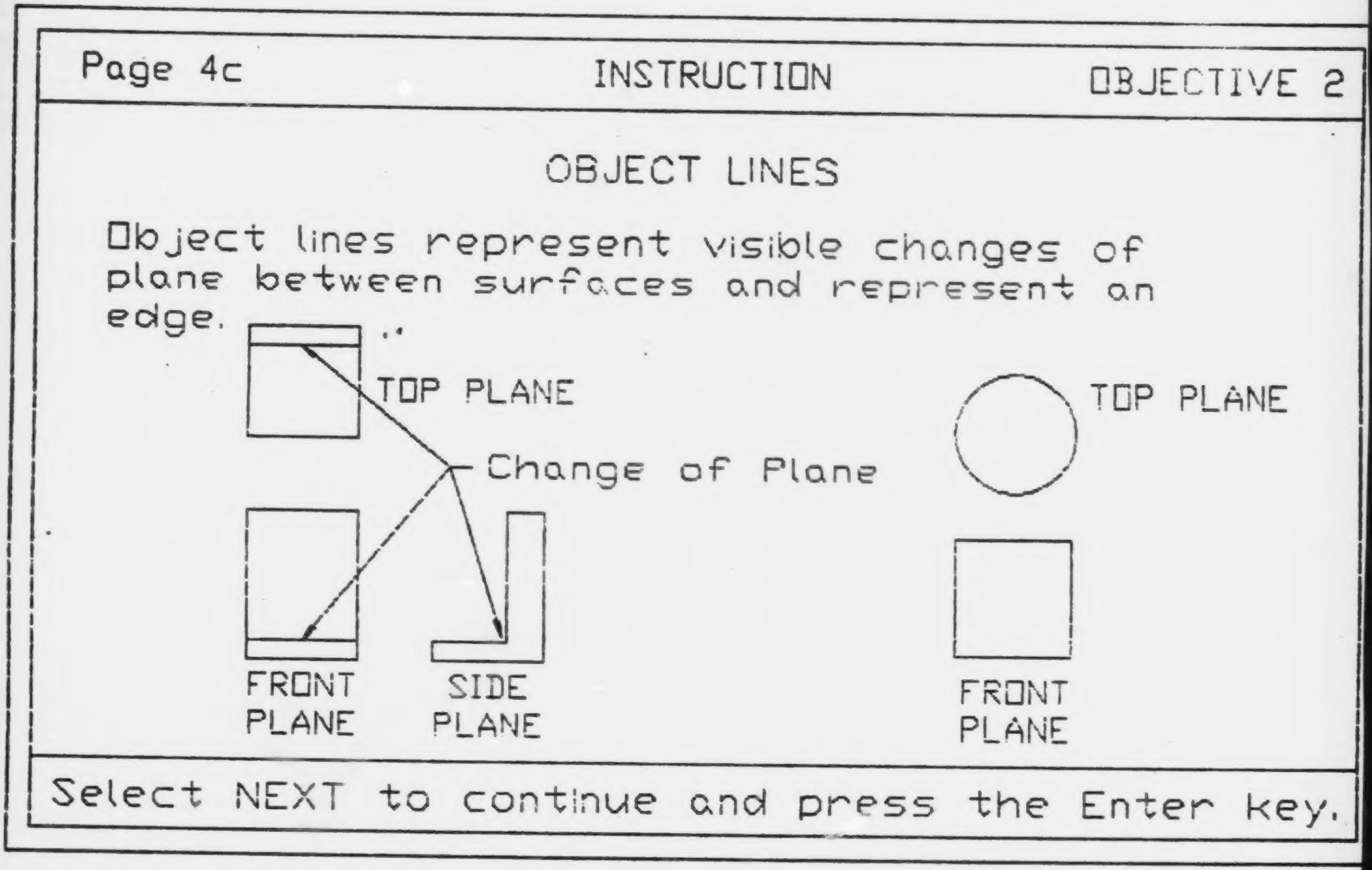
Page 4b INSTRUCTION Objective 2

OBJECT LINES

Example

TOP VIEW
FRONT VIEW
SIDE VIEW
PICTORIAL VIEW
PROJECTION VIEW

Select MORE INFO or NEXT to continue and press the Enter key.



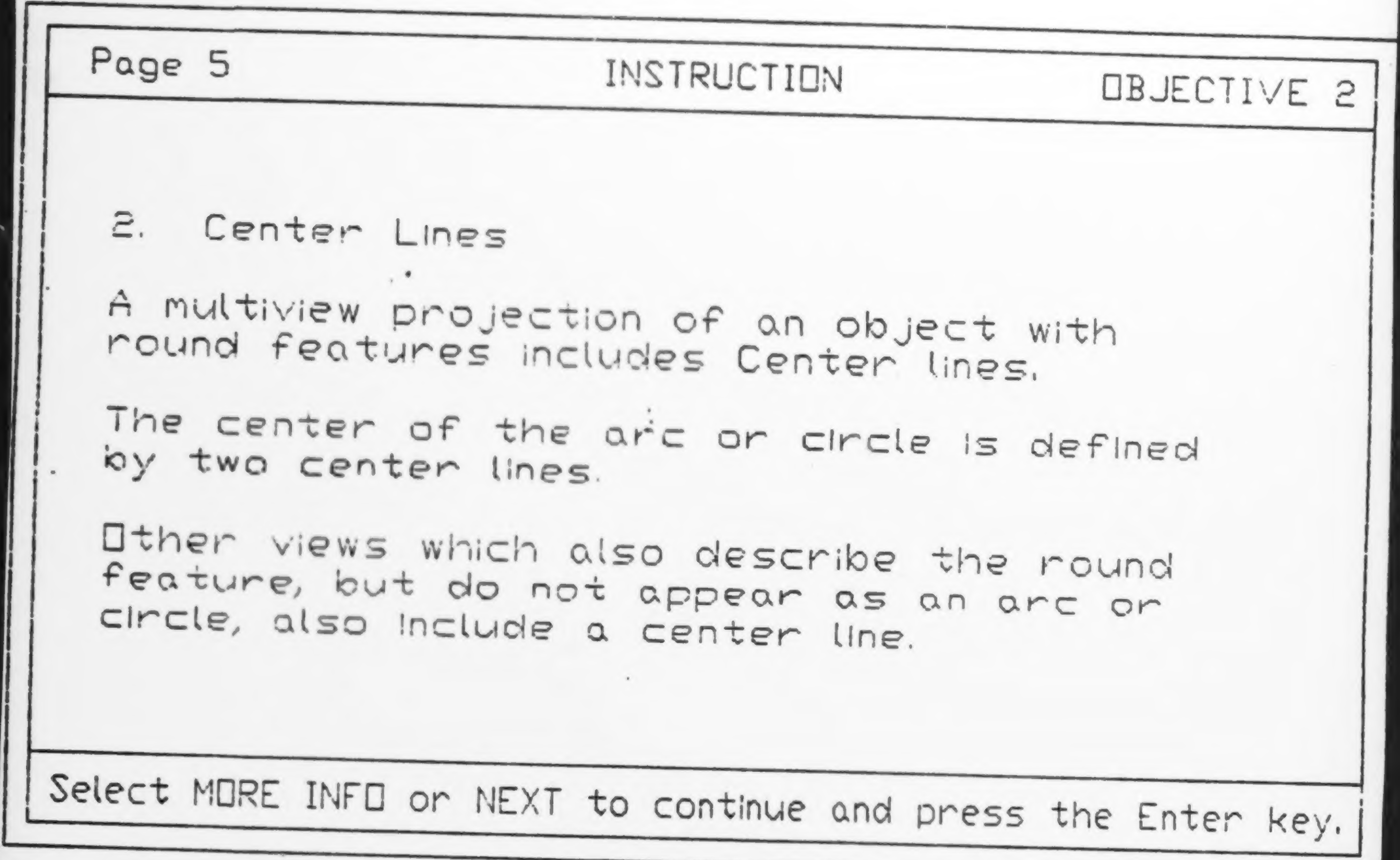
Page 4c INSTRUCTION OBJECTIVE 2

OBJECT LINES

Object lines represent visible changes of plane between surfaces and represent an edge.

TOP PLANE
Change of Plane
FRONT PLANE
SIDE PLANE
TOP PLANE
FRONT PLANE

Select NEXT to continue and press the Enter key.



Page 5 INSTRUCTION OBJECTIVE 2

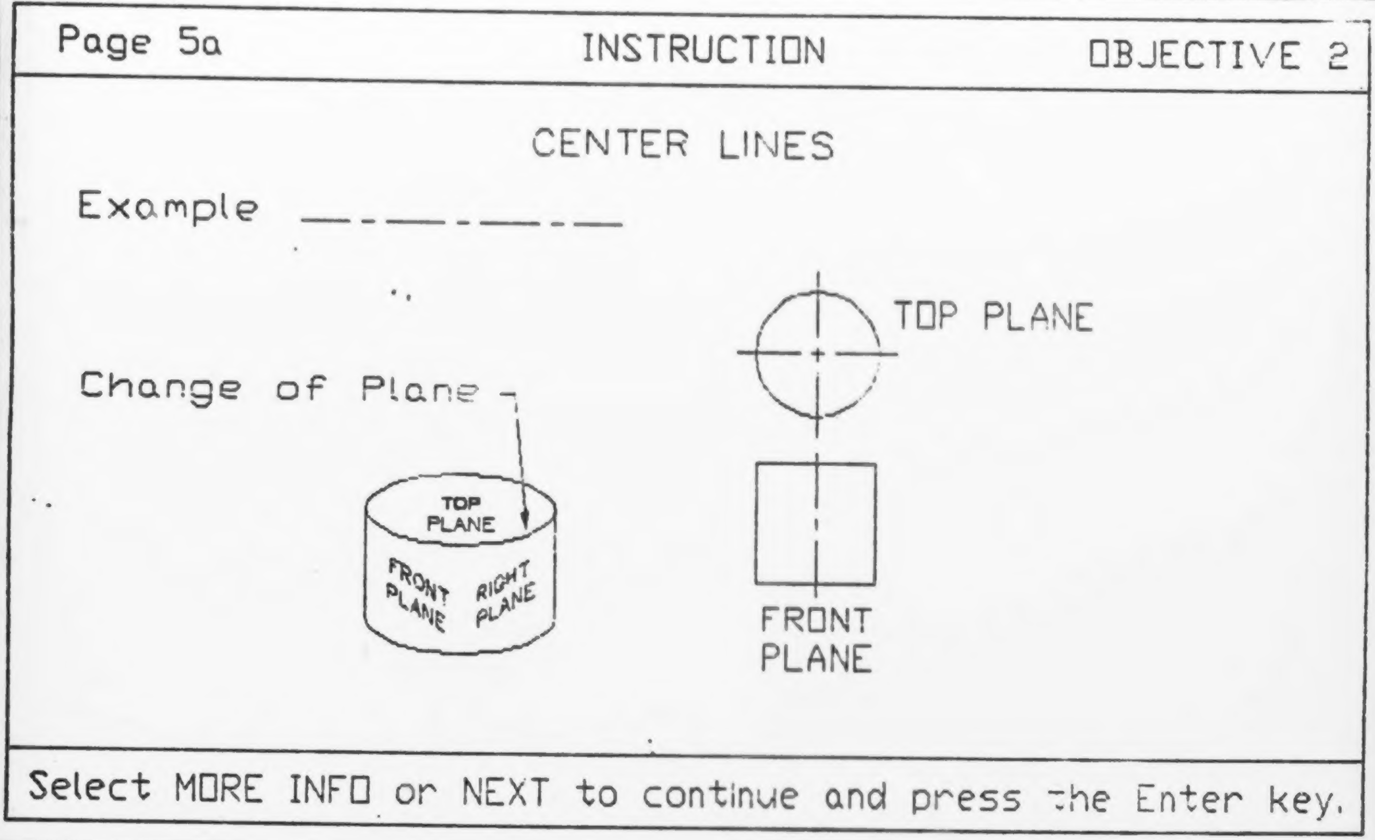
2. Center Lines

A multiview projection of an object with round features includes Center lines.

The center of the arc or circle is defined by two center lines.

Other views which also describe the round feature, but do not appear as an arc or circle, also include a center line.

Select MORE INFO or NEXT to continue and press the Enter key.



Page 5a INSTRUCTION OBJECTIVE 2

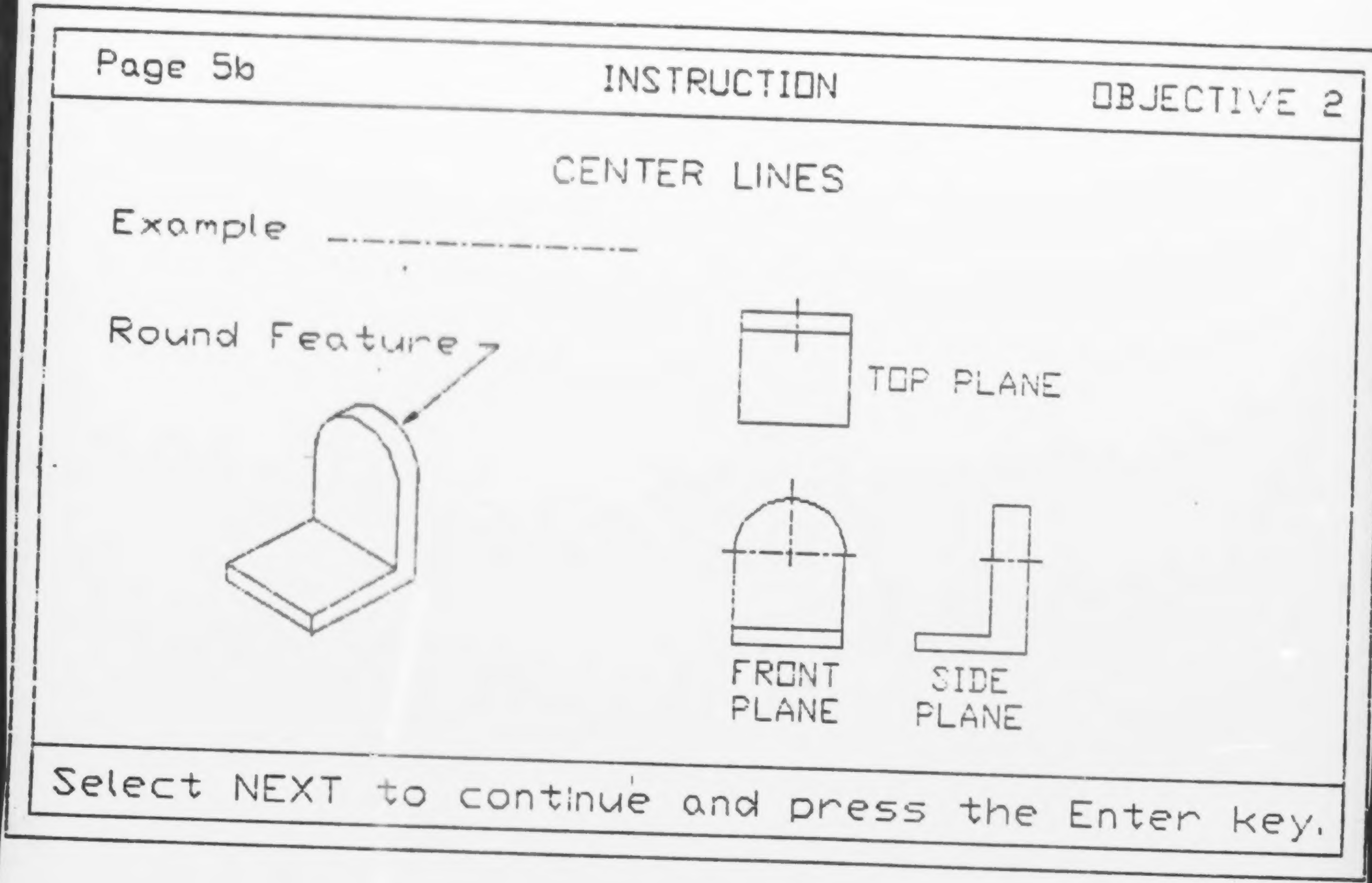
CENTER LINES

Example

Change of Plane

TOP PLANE
FRONT PLANE
RIGHT PLANE
TOP PLANE
FRONT PLANE

Select MORE INFO or NEXT to continue and press the Enter key.



Page 5b INSTRUCTION OBJECTIVE 2

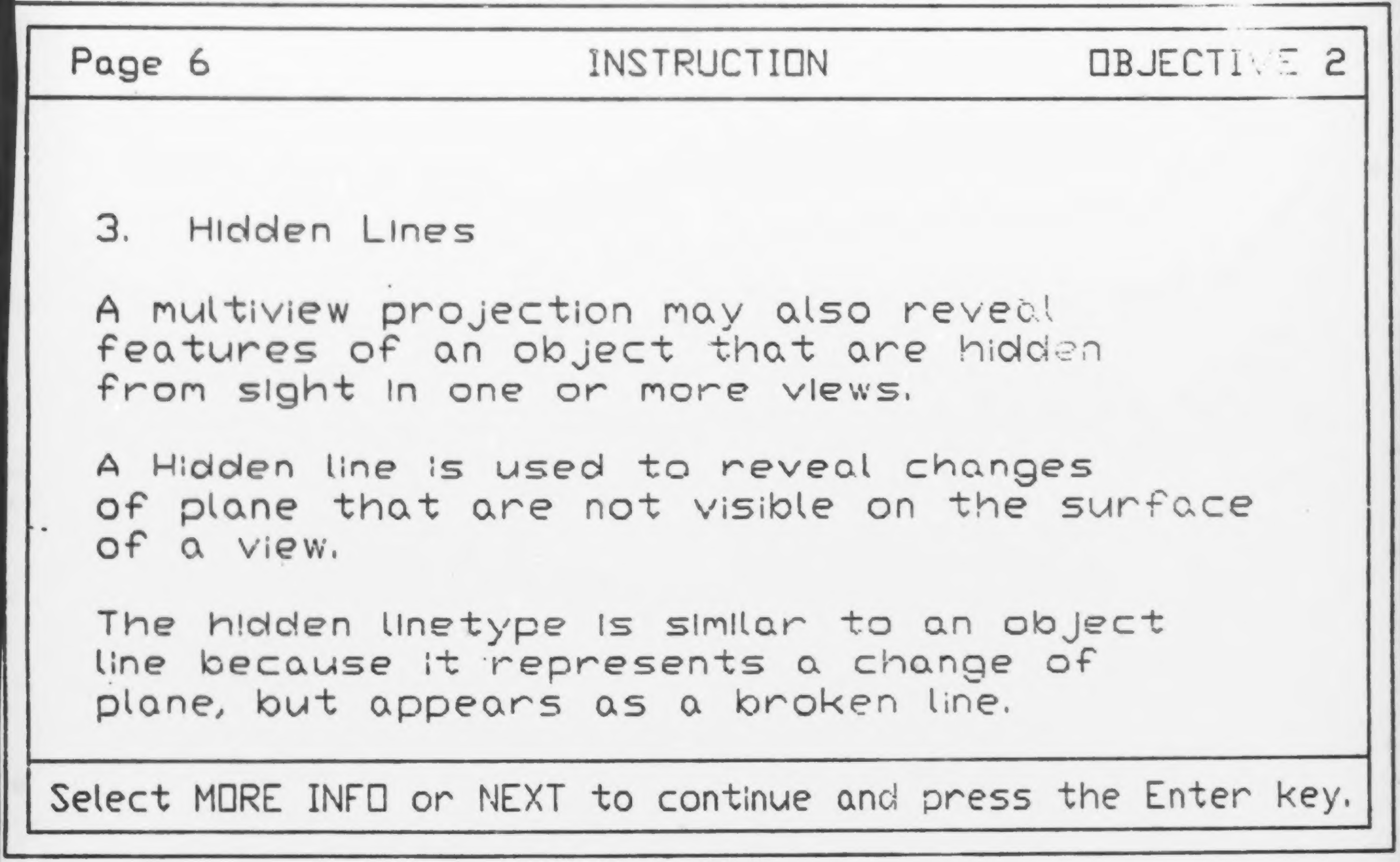
CENTER LINES

Example —·—·—·—·—·—·—

Round Feature

TOP PLANE
FRONT PLANE
SIDE PLANE

Select NEXT to continue and press the Enter key.



Page 6 INSTRUCTION OBJECTIVE 2

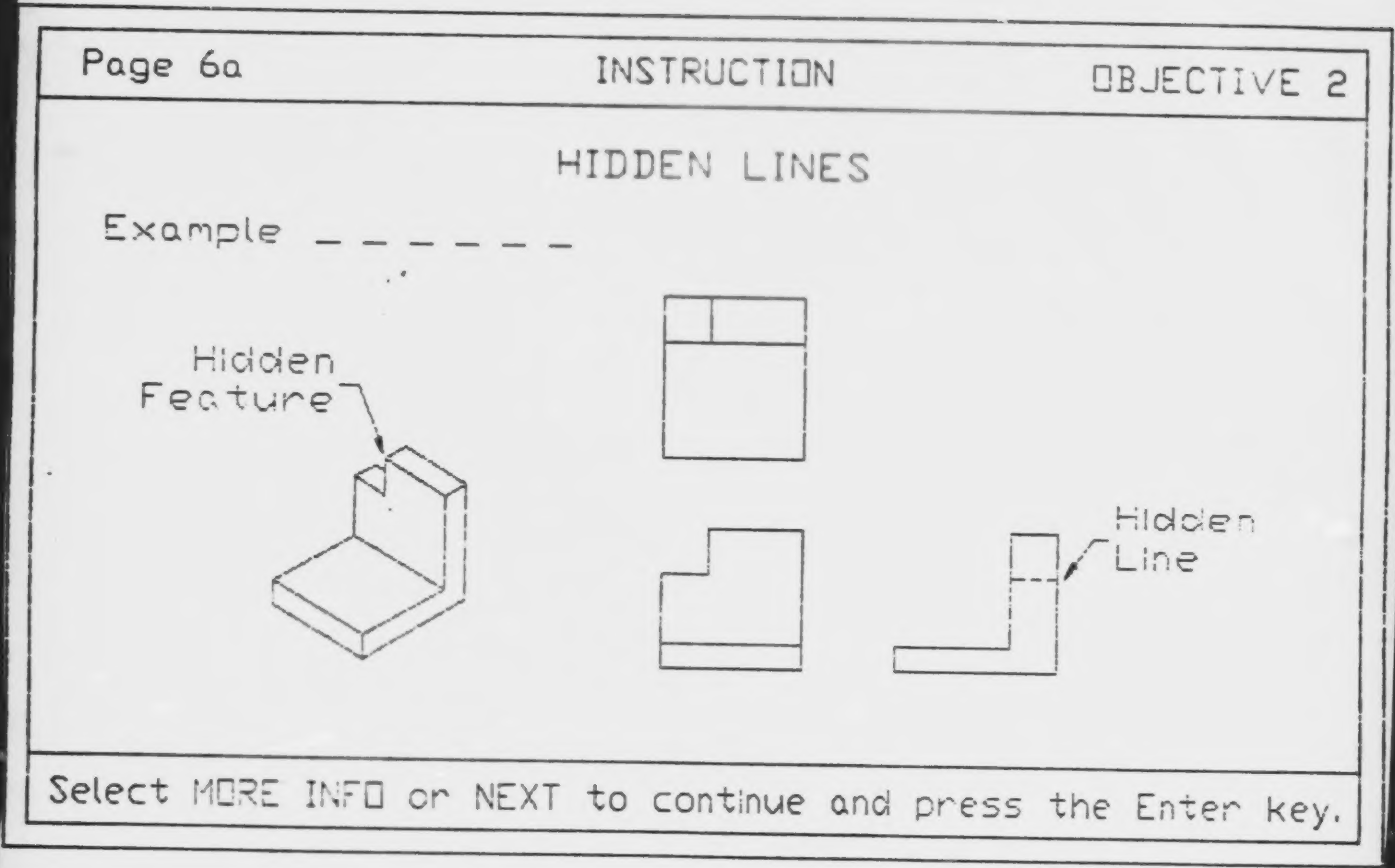
3. Hidden Lines

A multiview projection may also reveal features of an object that are hidden from sight in one or more views.

A Hidden line is used to reveal changes of plane that are not visible on the surface of a view.

The hidden linetype is similar to an object line because it represents a change of plane, but appears as a broken line.

Select MORE INFO or NEXT to continue and press the Enter key.



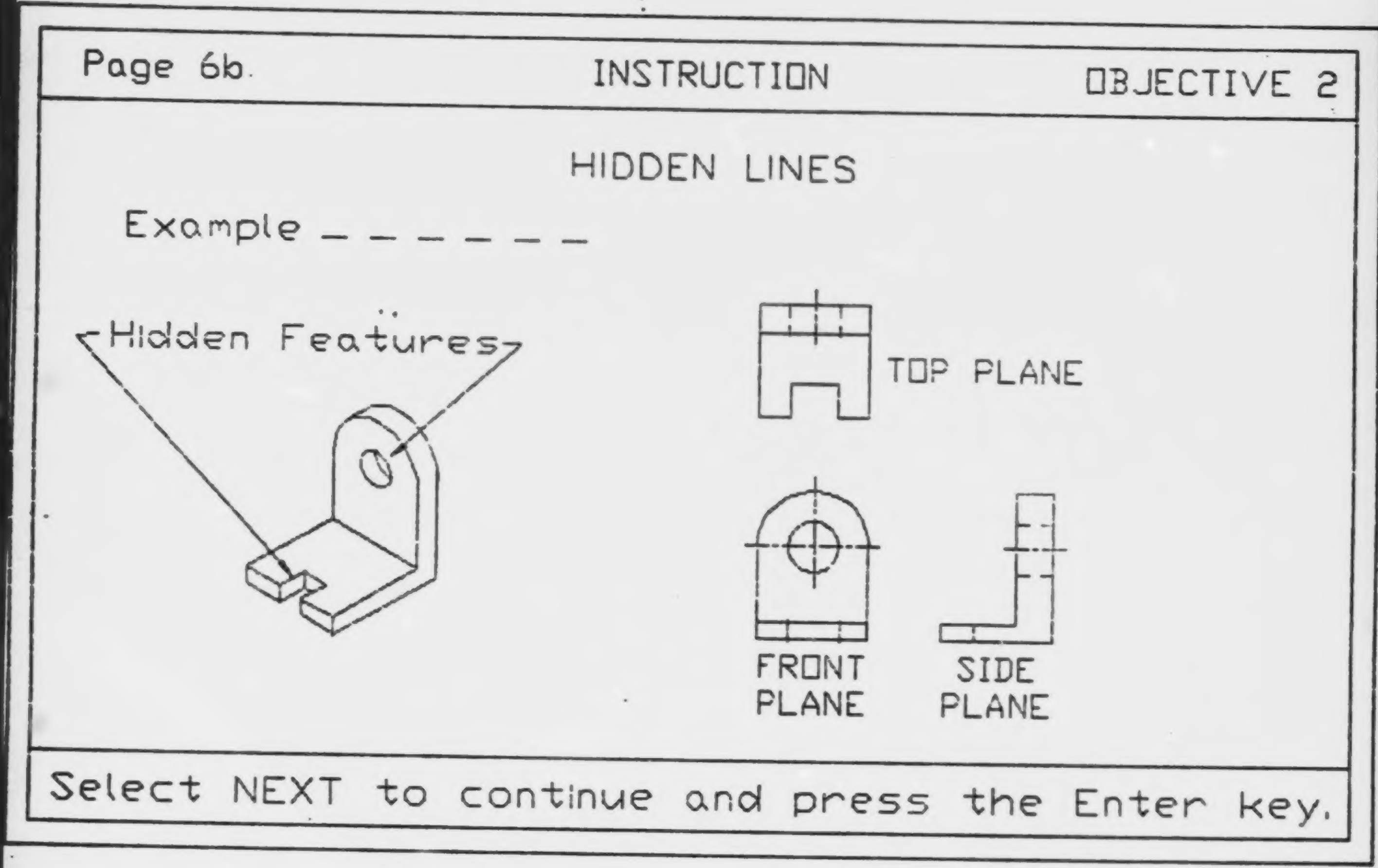
Page 6a INSTRUCTION OBJECTIVE 2

HIDDEN LINES

Example - - - - - -

Hidden
Feature
Hidden
Line

Select MORE INFO or NEXT to continue and press the Enter key.



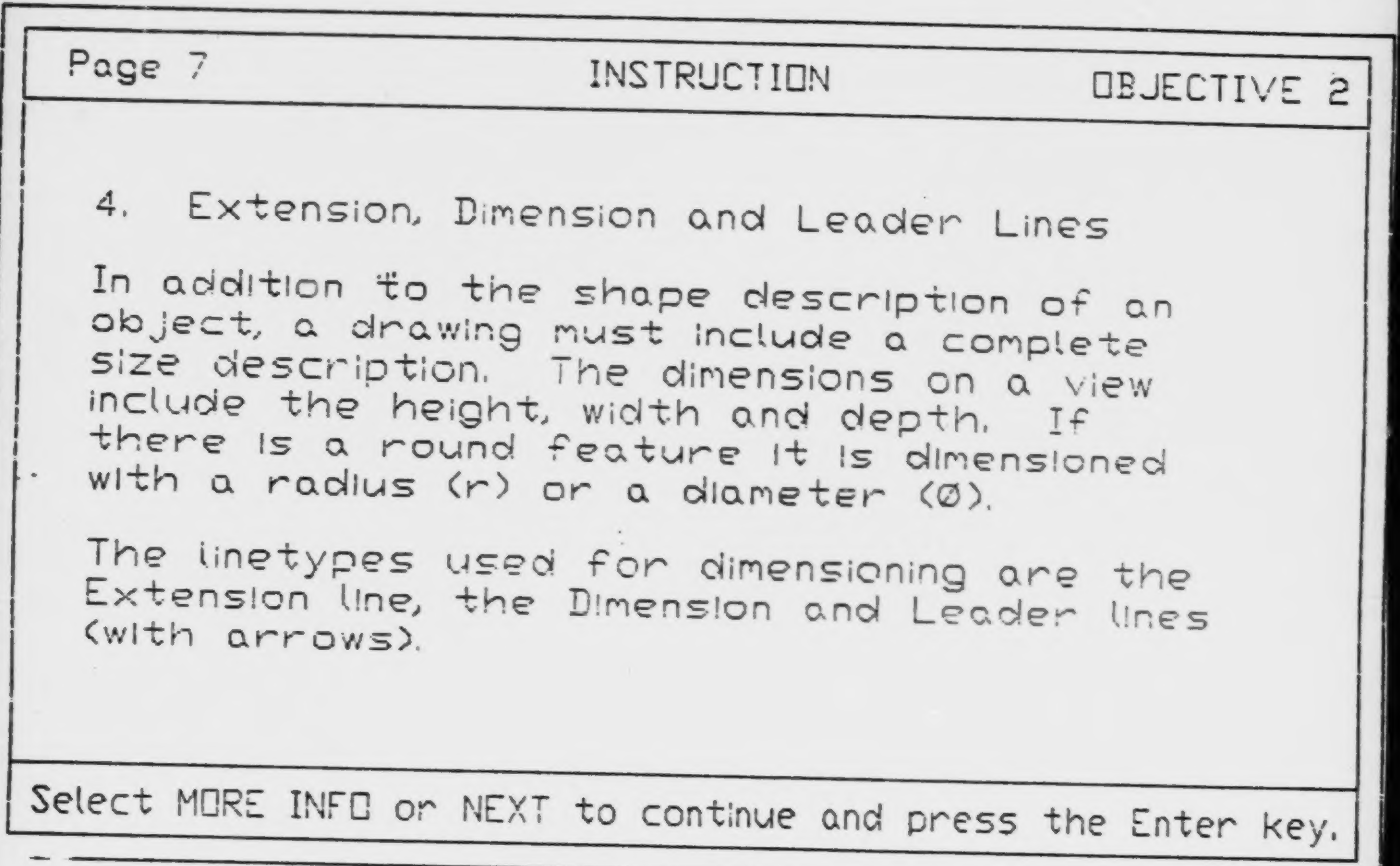
Page 6b INSTRUCTION OBJECTIVE 2

HIDDEN LINES

Example – – – – – –

Hidden Features
TOP PLANE
FRONT PLANE
SIDE PLANE

Select NEXT to continue and press the Enter key.



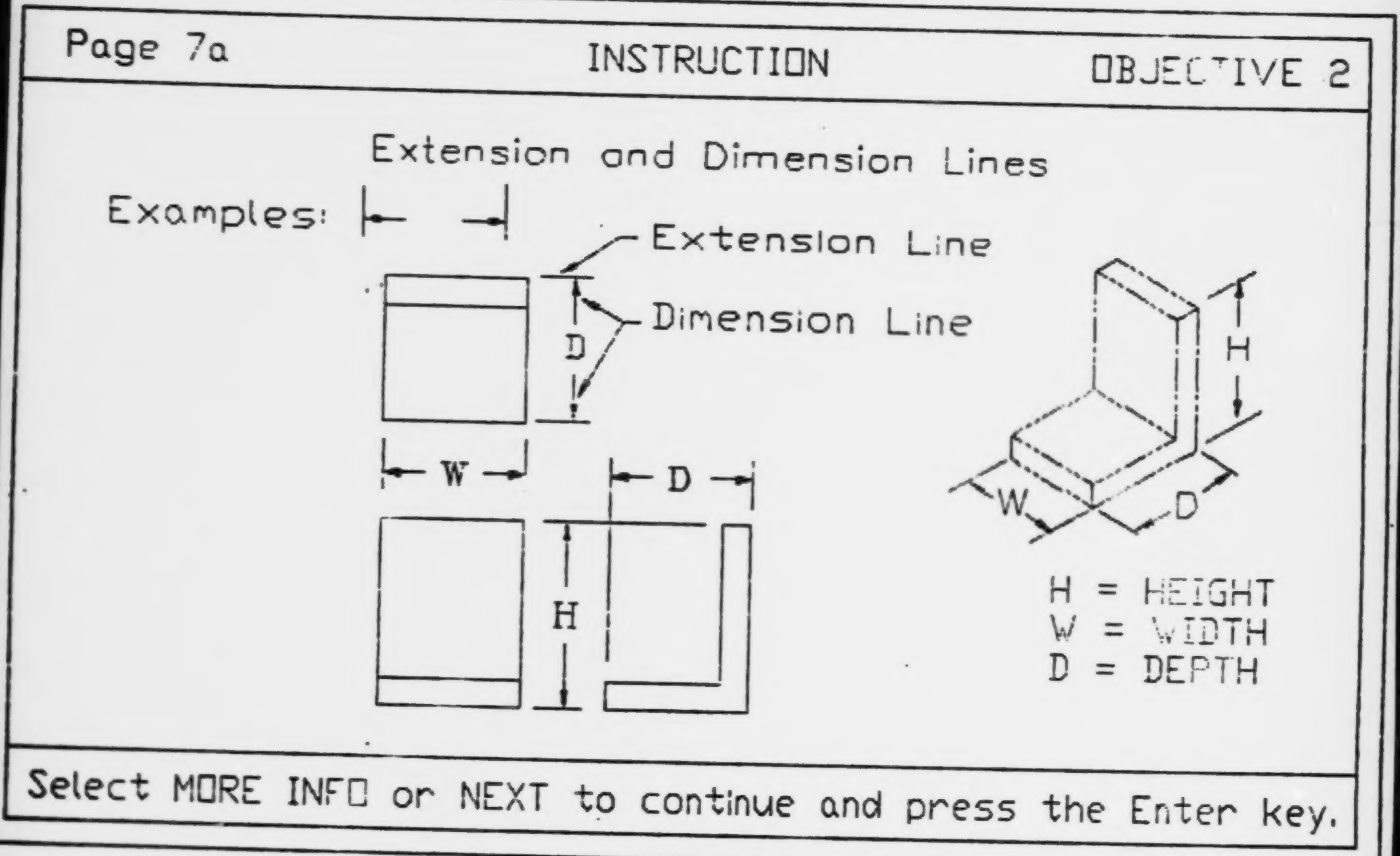
Page 7 INSTRUCTION OBJECTIVE 2

4. Extension, Dimension and Leader Lines

In addition to the shape description of an object, a drawing must include a complete size description. The dimensions on a view include the height, width and depth. If there is a round feature it is dimensioned with a radius (r) or a diameter (Ø).

The linetypes used for dimensioning are the Extension line, the Dimension and Leader lines (with arrows).

Select MORE INFO or NEXT to continue and press the Enter key.



Page 7a INSTRUCTION OBJECTIVE 2

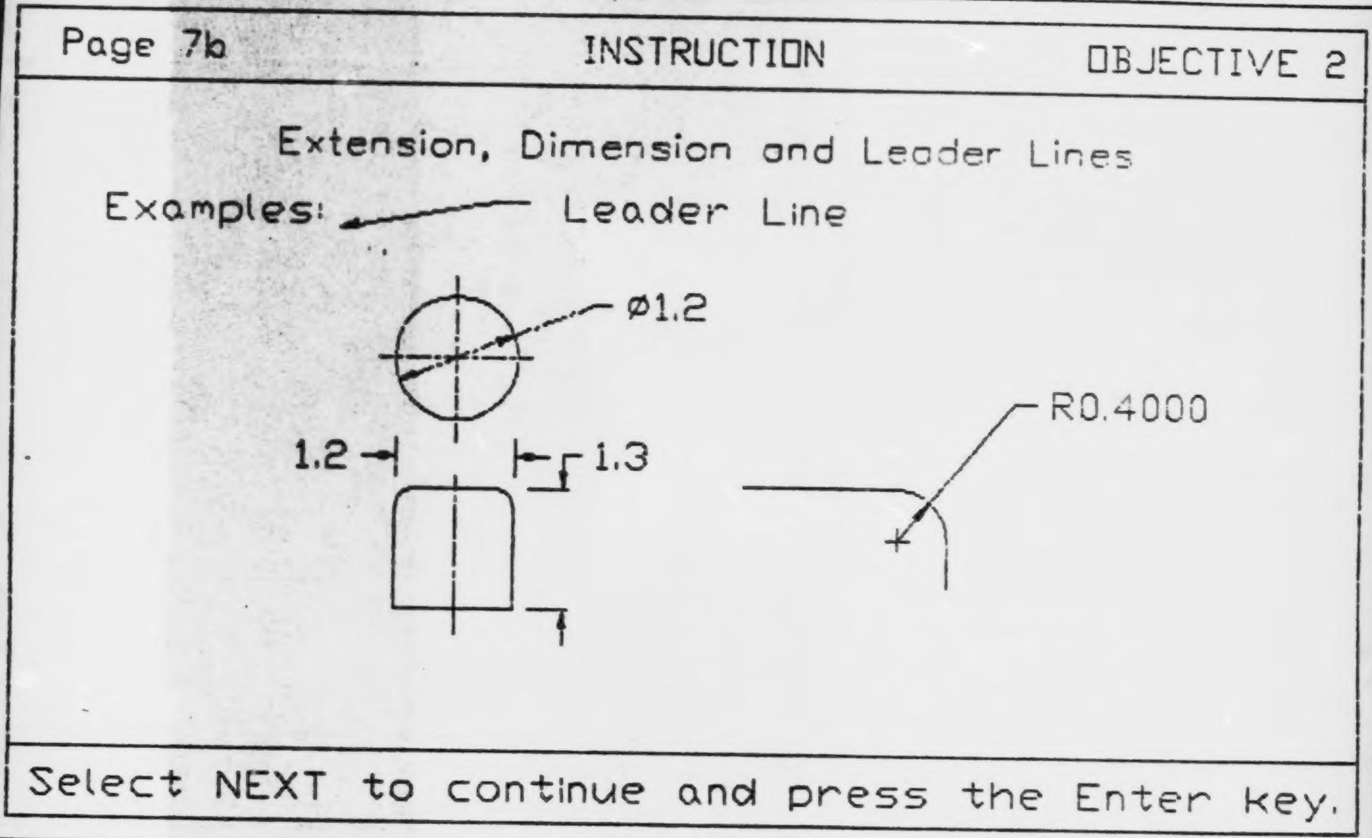
Extension and Dimension Lines

Examples:

Extension Line
Dimension Line
D
W
D
H
H
W
D

H = HEIGHT
W = WIDTH
D = DEPTH

Select MORE INFO or NEXT to continue and press the Enter key.

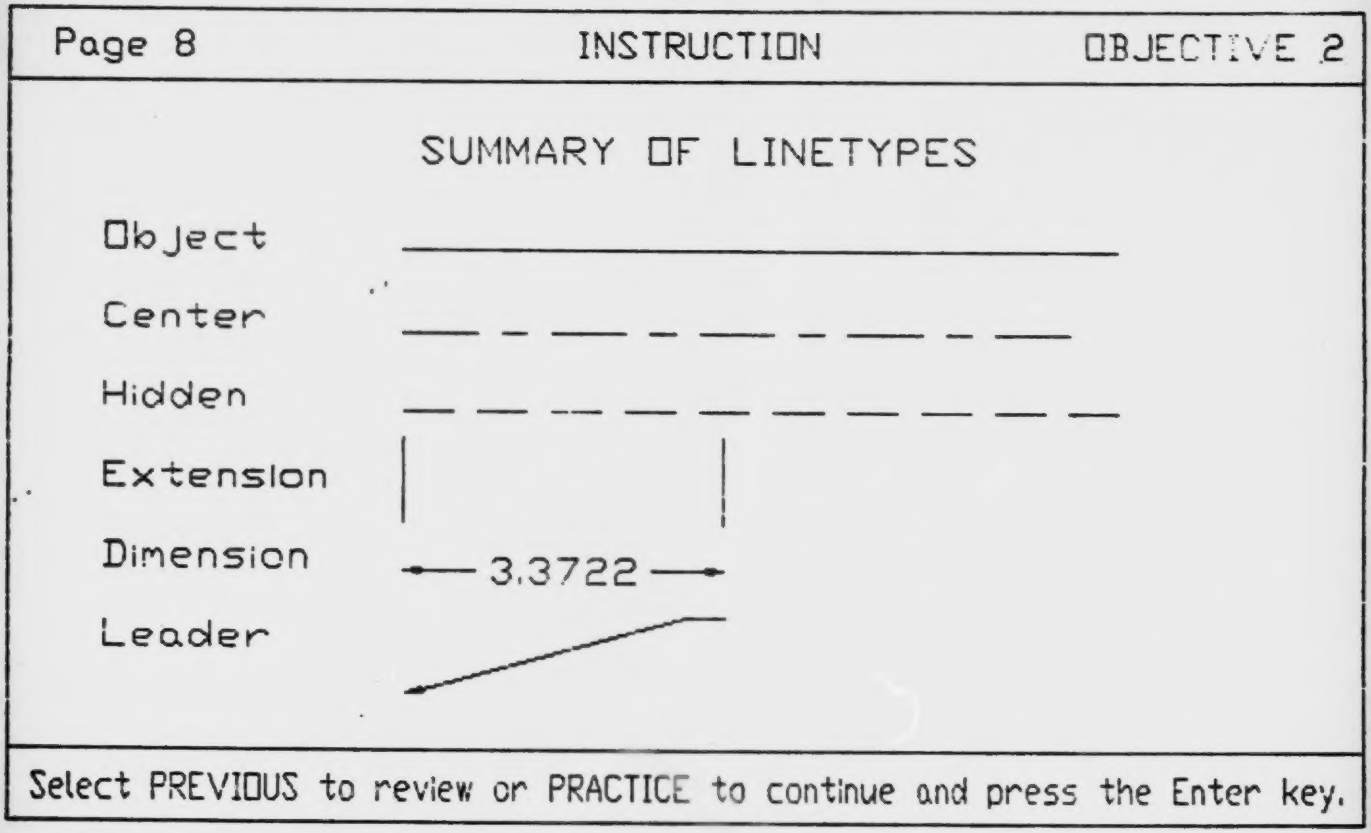


Page 7b INSTRUCTION OBJECTIVE 2

Extension, Dimension and Leader Lines

Examples: Leader Line

Select NEXT to continue and press the Enter key.



Page 8 INSTRUCTION OBJECTIVE 2

SUMMARY OF LINETYPES

Object

Center

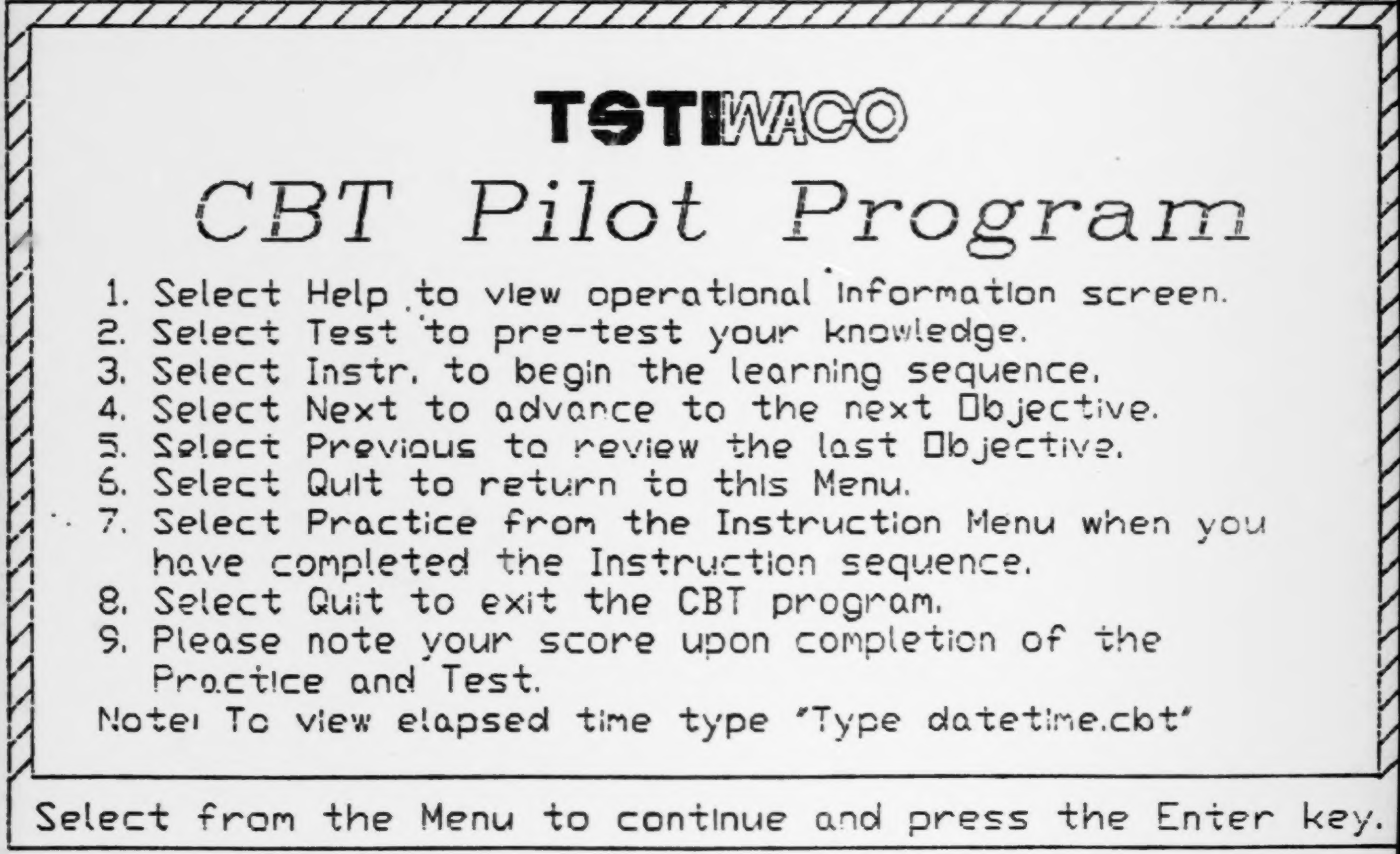
Hidden

Extension

Dimension

Leader

Select PREVIOUS to review or PRACTICE to continue and press the Enter key.



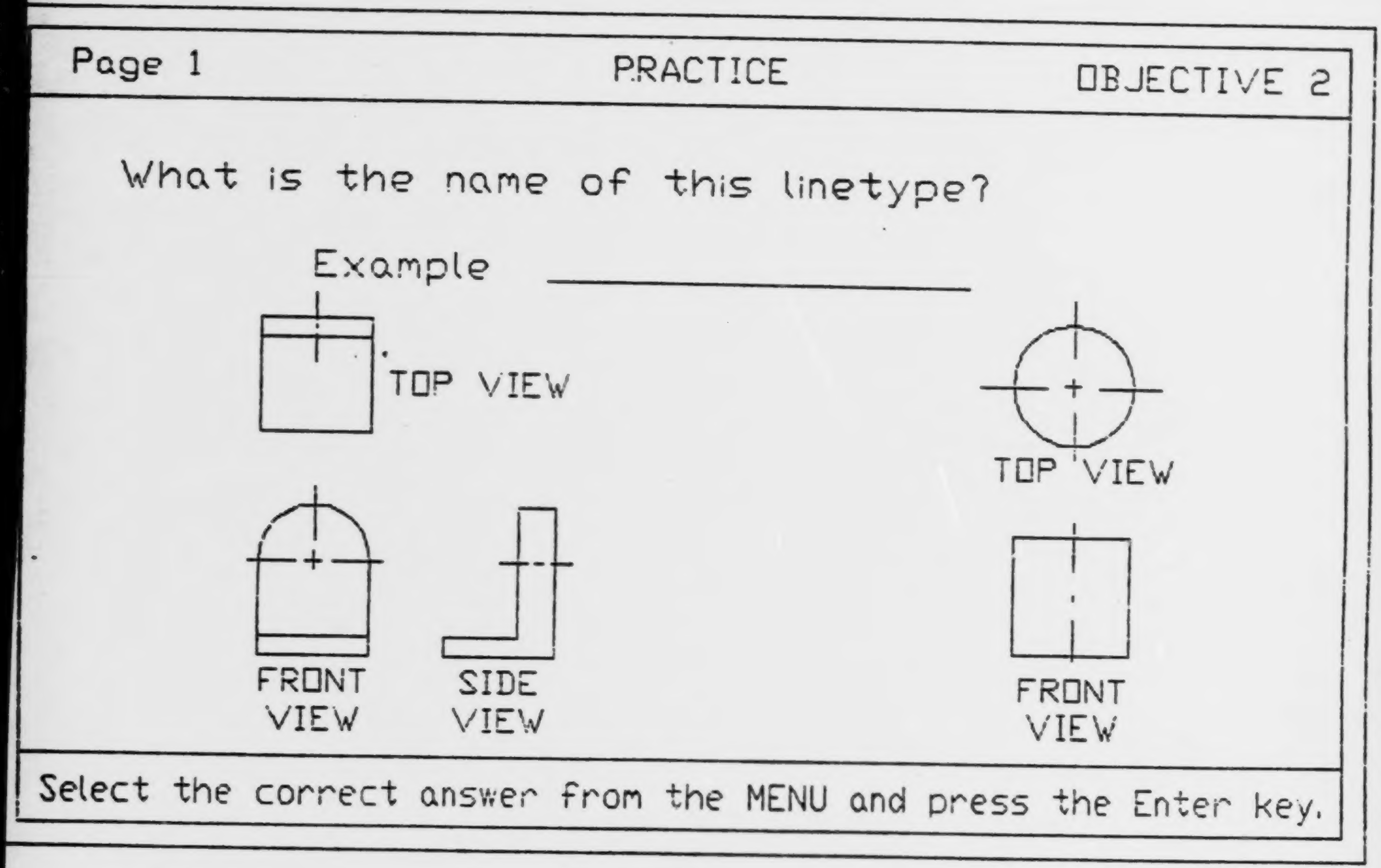
TSTI WACO

CBT Pilot Program

1. Select Help to view operational information screen.
2. Select Test to pre-test your knowledge.
3. Select Instr. to begin the learning sequence.
4. Select Next to advance to the next Objective.
5. Select Previous to review the last Objective.
6. Select Quit to return to this Menu.
7. Select Practice from the Instruction Menu when you have completed the Instruction sequence.
8. Select Quit to exit the CBT program.
9. Please note your score upon completion of the Practice and Test.

Note: To view elapsed time type "Type datetime.cbt"

Select from the Menu to continue and press the Enter key.



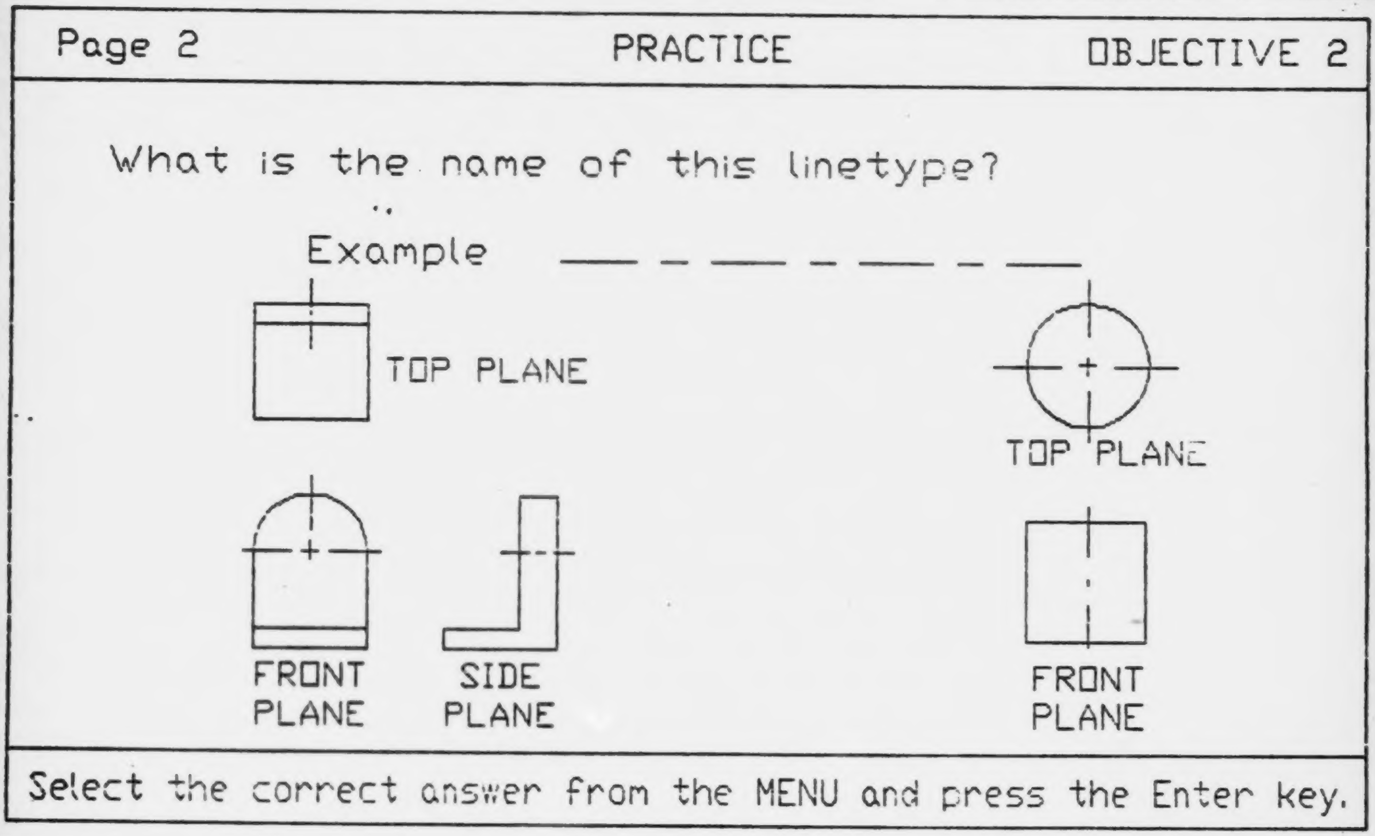
Page 1 PRACTICE OBJECTIVE 2

What is the name of this linetype?

Example ______________________

TOP VIEW
FRONT VIEW
SIDE VIEW
TOP VIEW
FRONT VIEW

Select the correct answer from the MENU and press the Enter key.



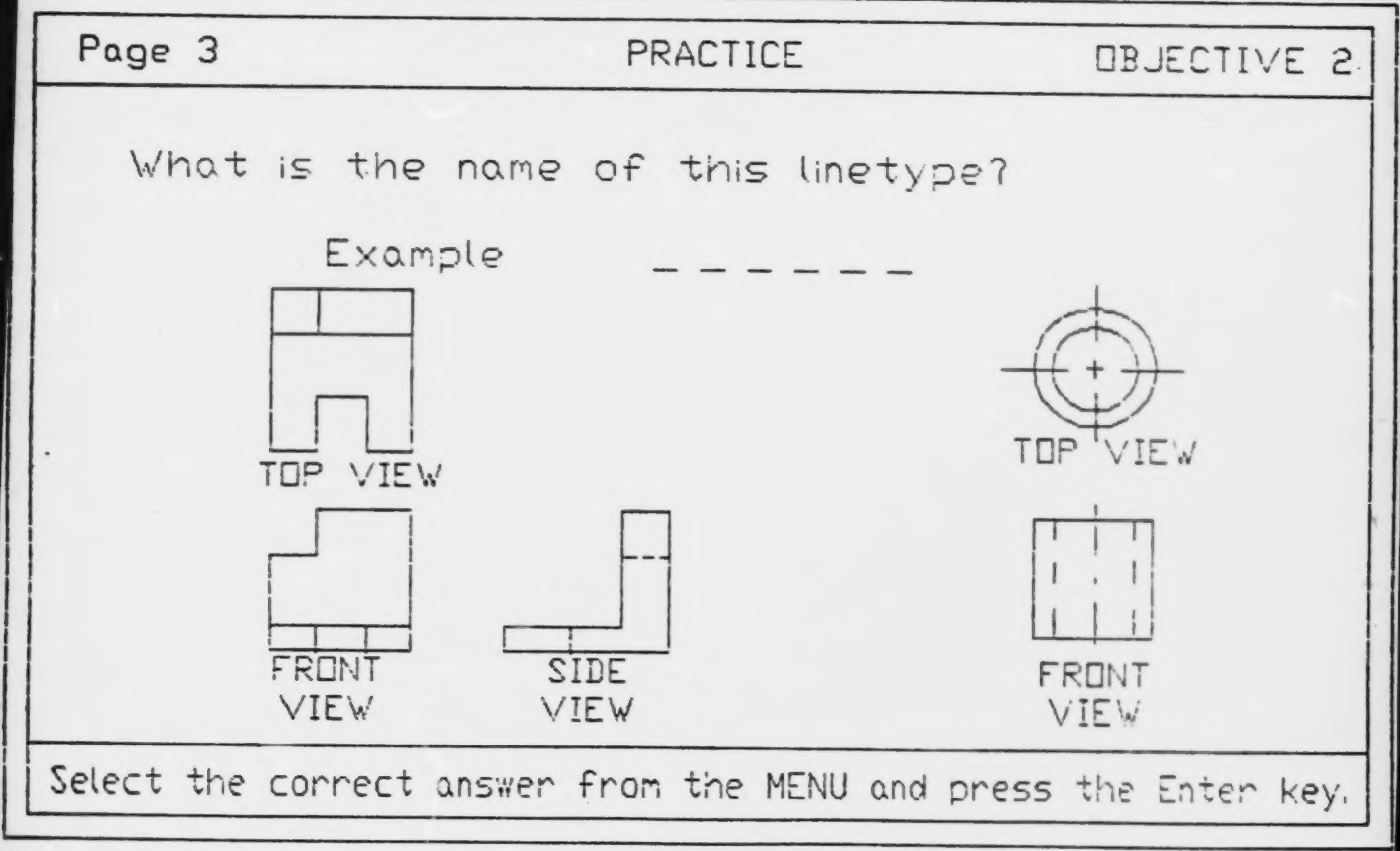
Page 2 PRACTICE OBJECTIVE 2

What is the name of this linetype?

Example

TOP PLANE
TOP PLANE
FRONT PLANE
SIDE PLANE
FRONT PLANE

Select the correct answer from the MENU and press the Enter key.



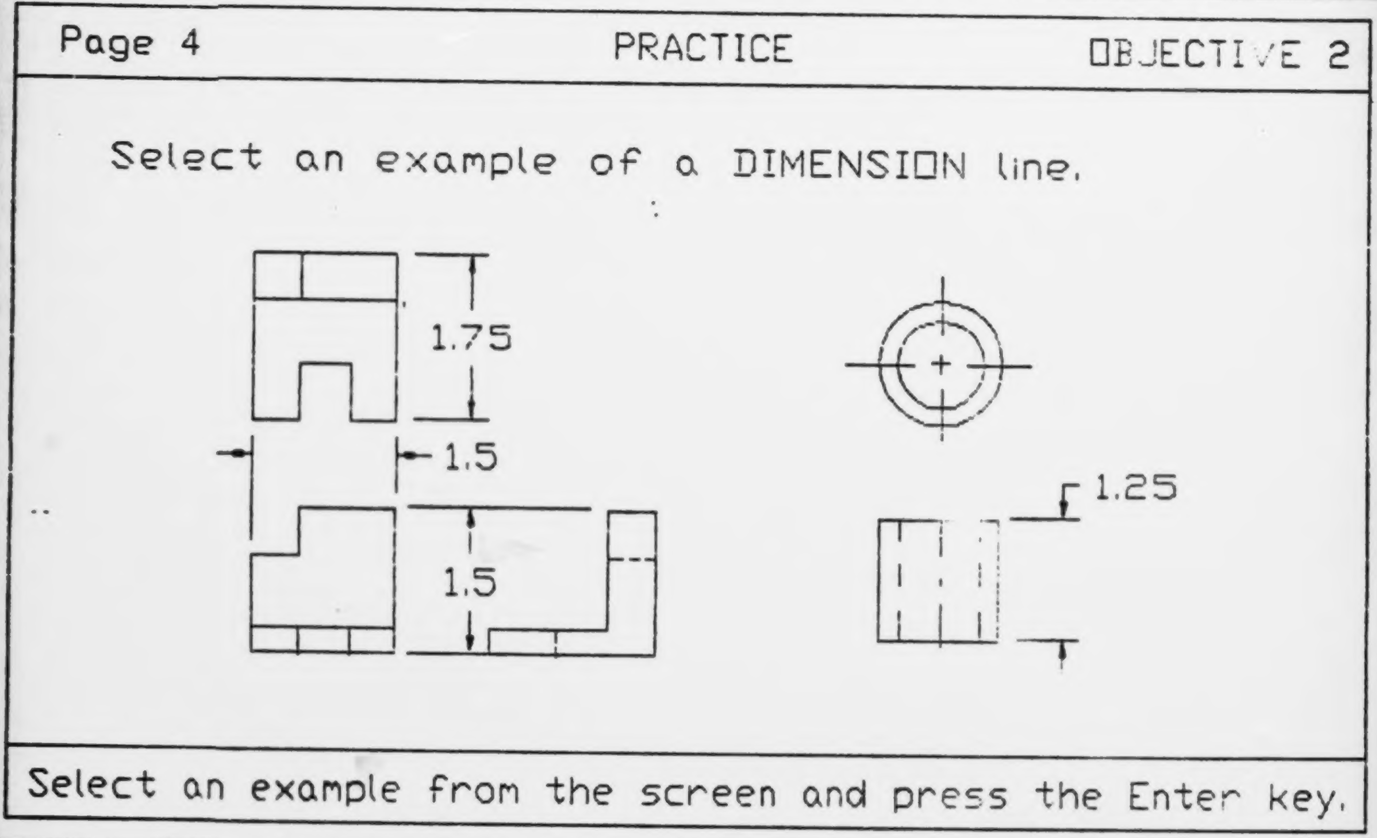
Page 3 PRACTICE OBJECTIVE 2

What is the name of this linetype?

Example _ _ _ _ _ _

TOP VIEW
FRONT VIEW
SIDE VIEW
TOP VIEW
FRONT VIEW

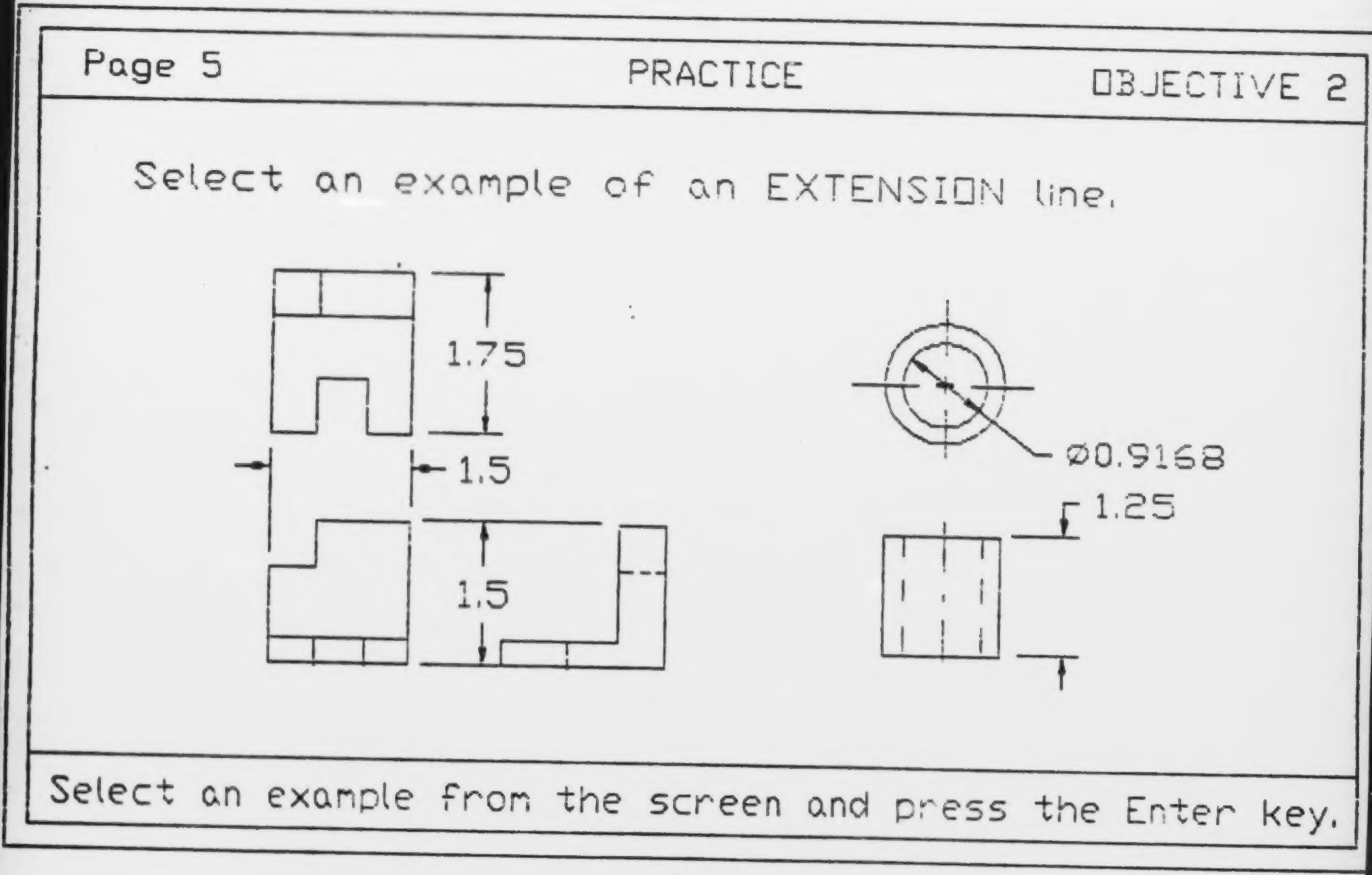
Select the correct answer from the MENU and press the Enter key.



Page 4 PRACTICE OBJECTIVE 2

Select an example of a DIMENSION line.

Select an example from the screen and press the Enter key.

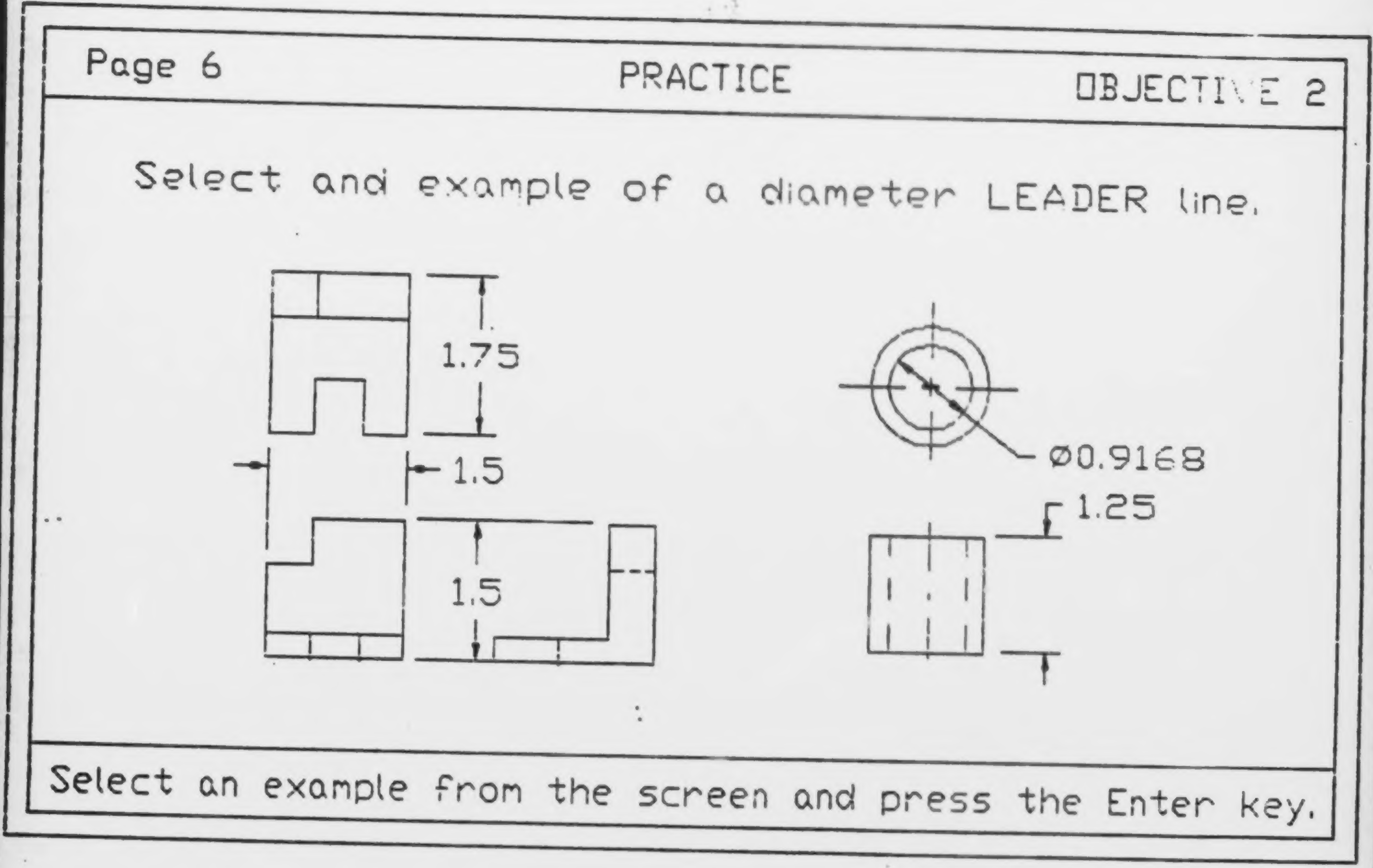


Page 5 PRACTICE OBJECTIVE 2

Select an example of an EXTENSION line.

1.75
1.5
1.5
Ø0.9168
1.25

Select an example from the screen and press the Enter key.



Page 6 PRACTICE OBJECTIVE 2

Select and example of a diameter LEADER line.

1.75
1.5
1.5
Ø0.9168
1.25

Select an example from the screen and press the Enter key.

TEXAS STATE TECHNICAL INSTITUTE

TSTI WACO

PRESENTS

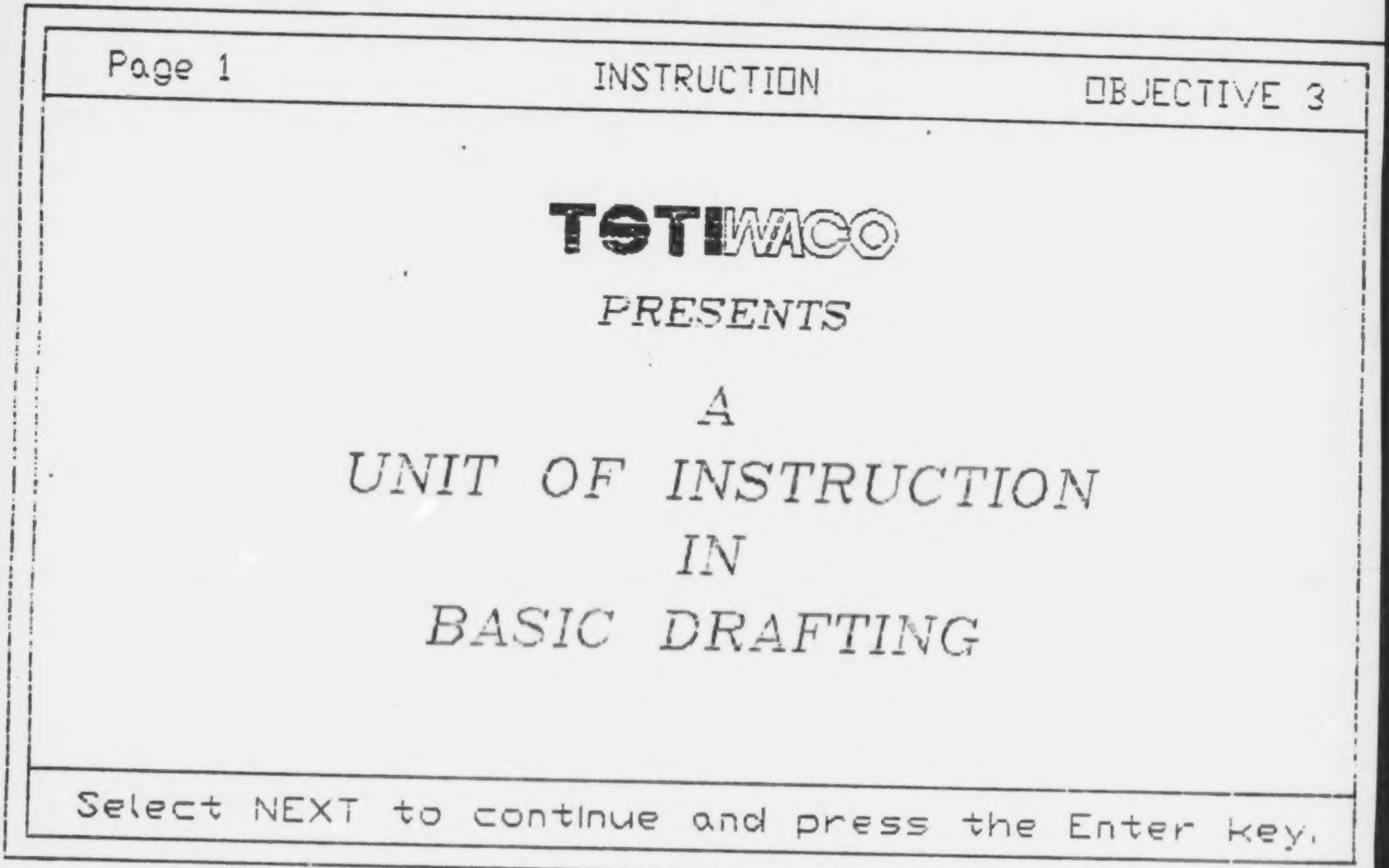
A

CBT Pilot Program

Designed by Mardelle A. Sauer

Through a grant by the Coordinating Board

Texas College & University System



Page 1 INSTRUCTION OBJECTIVE 3

TSTI WACO

PRESENTS

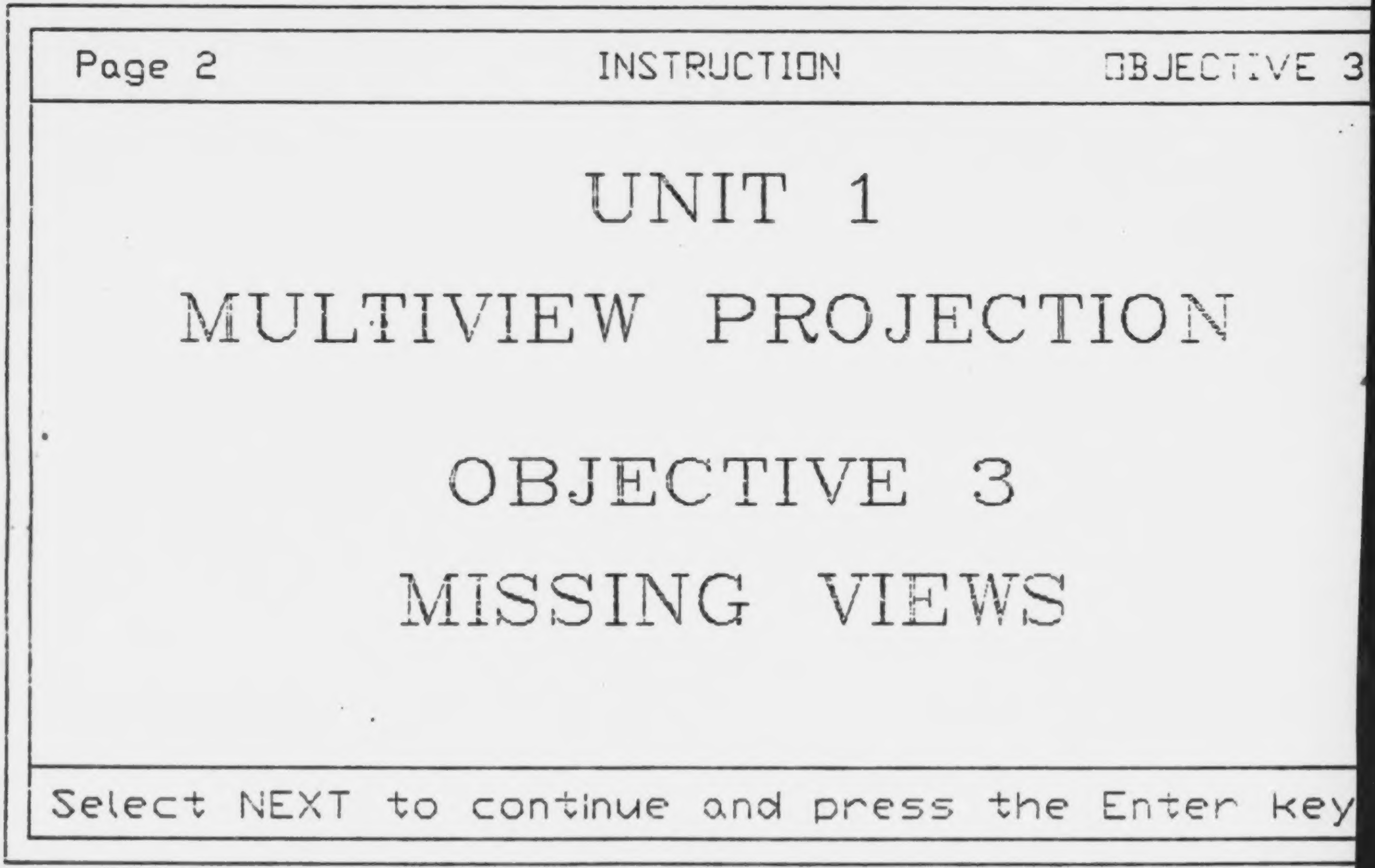
A

UNIT OF INSTRUCTION

IN

BASIC DRAFTING

Select NEXT to continue and press the Enter key.



Page 2 INSTRUCTION OBJECTIVE 3

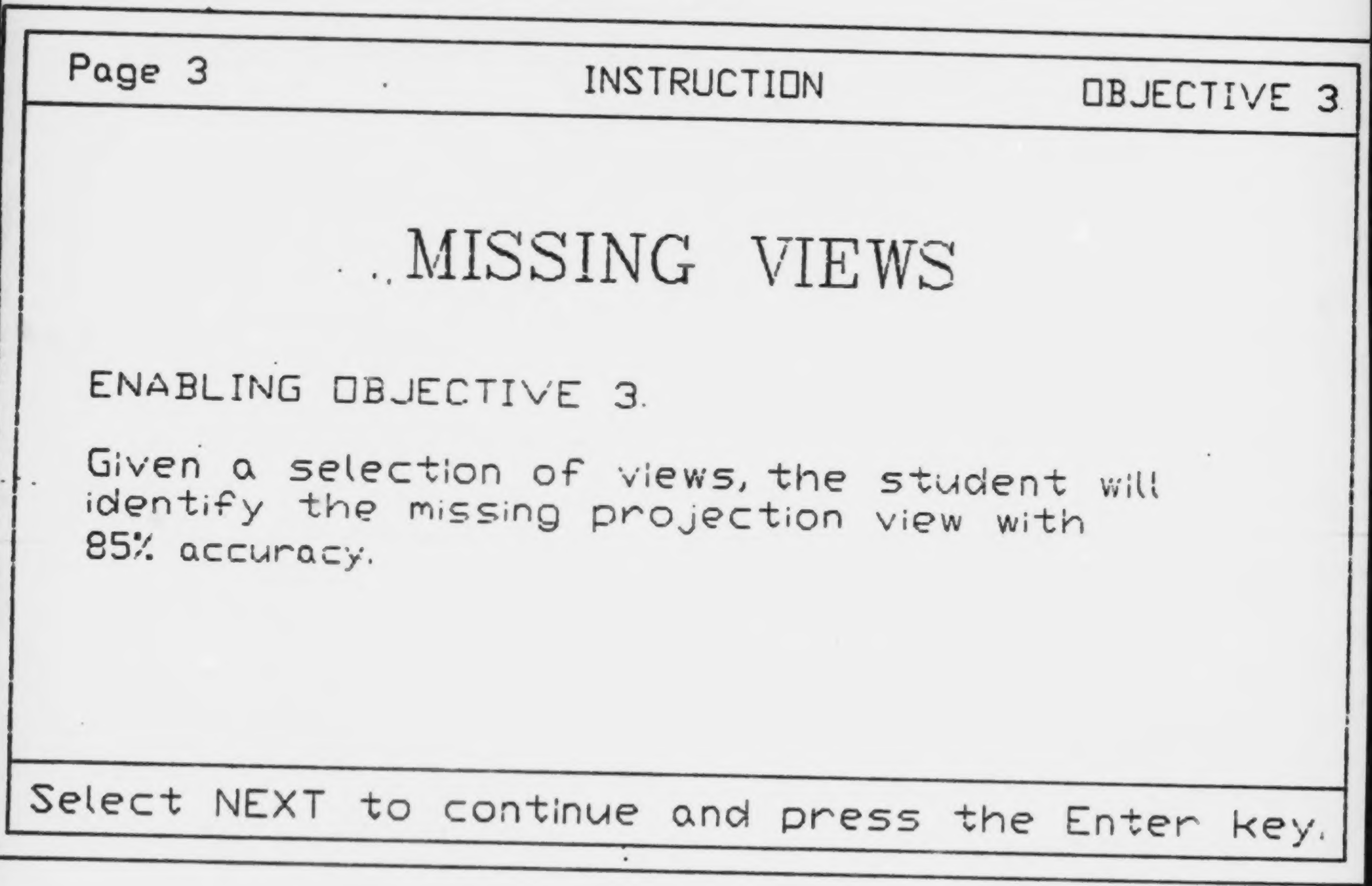
UNIT 1

MULTIVIEW PROJECTION

OBJECTIVE 3

MISSING VIEWS

Select NEXT to continue and press the Enter key



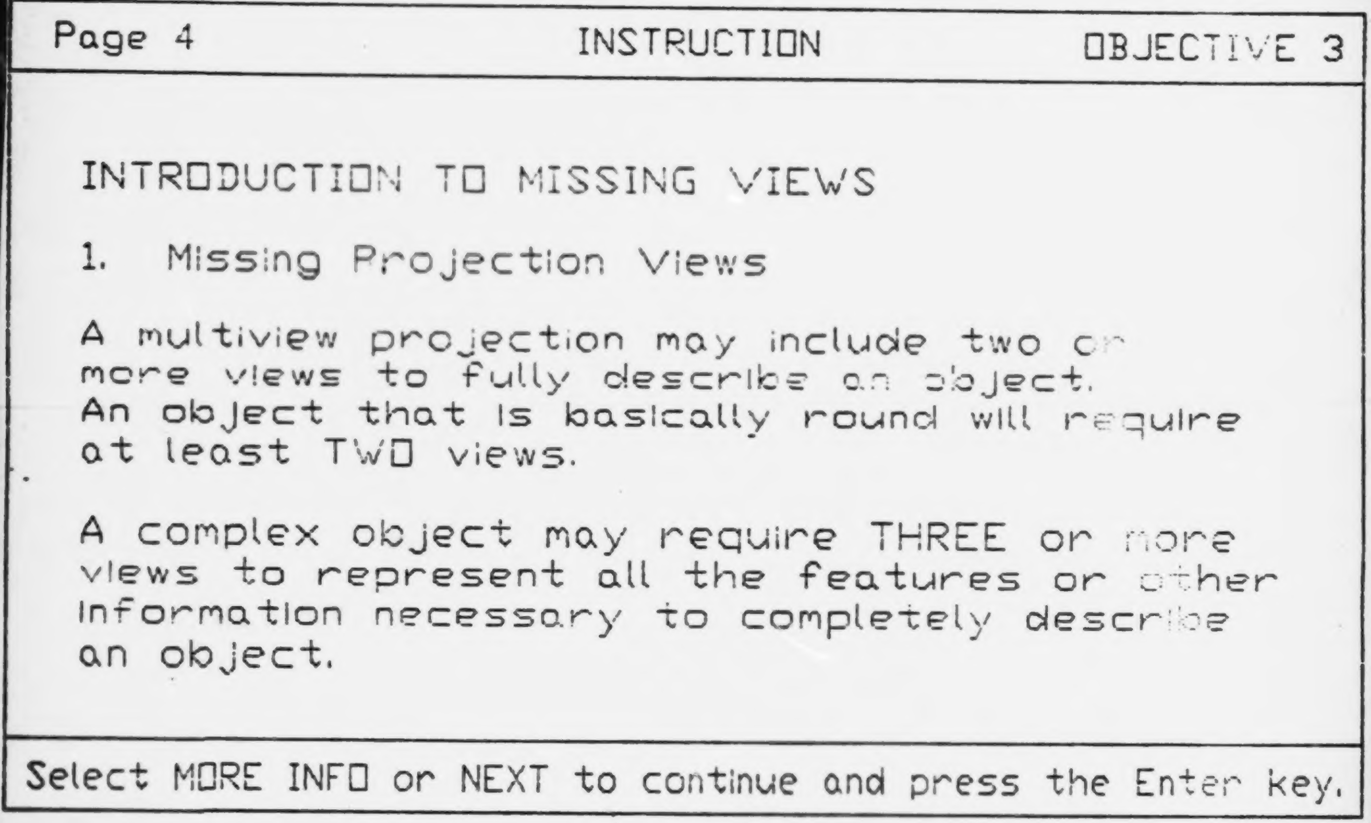
Page 3 INSTRUCTION OBJECTIVE 3

MISSING VIEWS

ENABLING OBJECTIVE 3.

Given a selection of views, the student will identify the missing projection view with 85% accuracy.

Select NEXT to continue and press the Enter key.



Page 4 INSTRUCTION OBJECTIVE 3

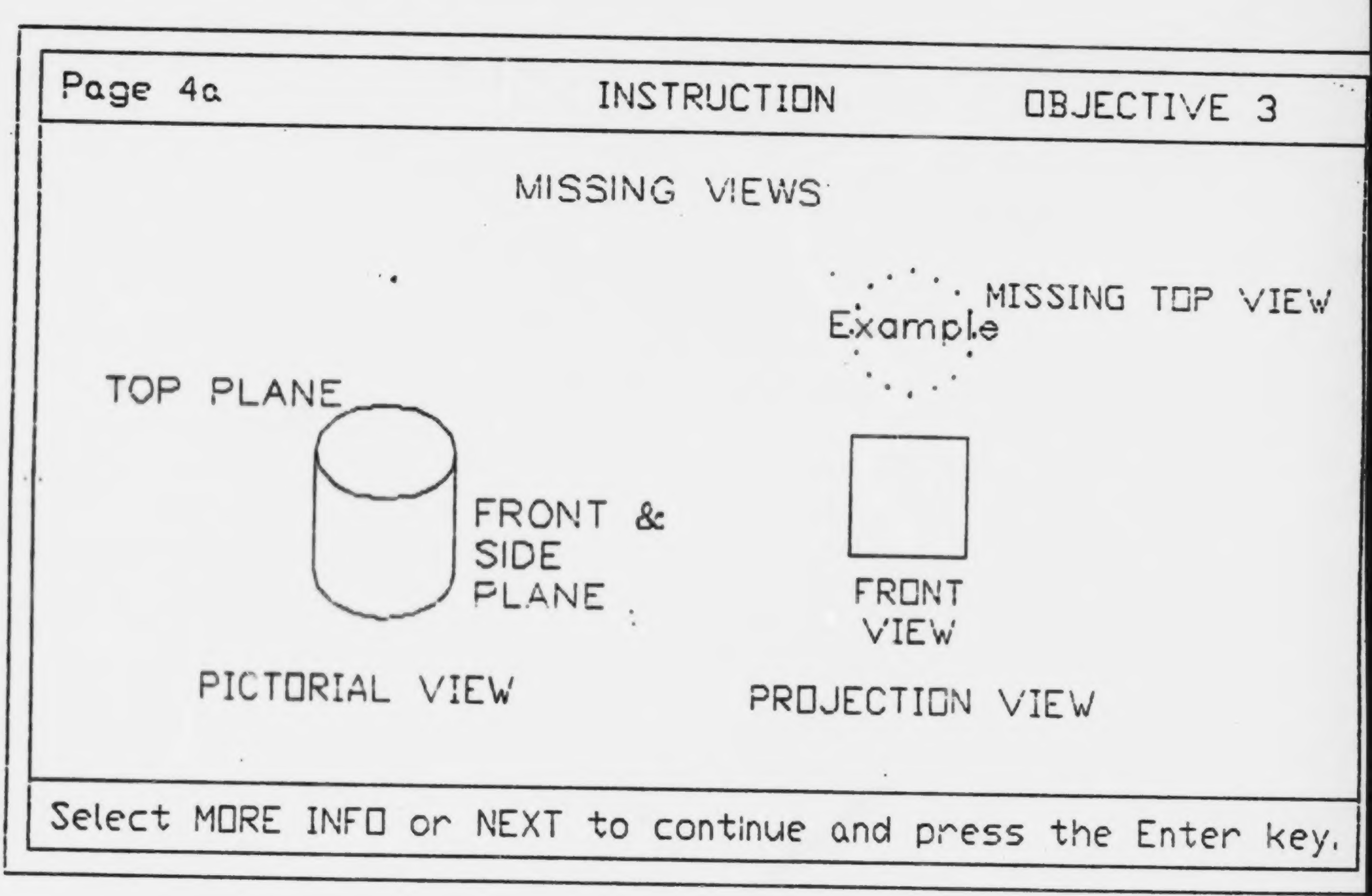
INTRODUCTION TO MISSING VIEWS

1. Missing Projection Views

A multiview projection may include two or more views to fully describe an object. An object that is basically round will require at least TWO views.

A complex object may require THREE or more views to represent all the features or other information necessary to completely describe an object.

Select MORE INFO or NEXT to continue and press the Enter key.

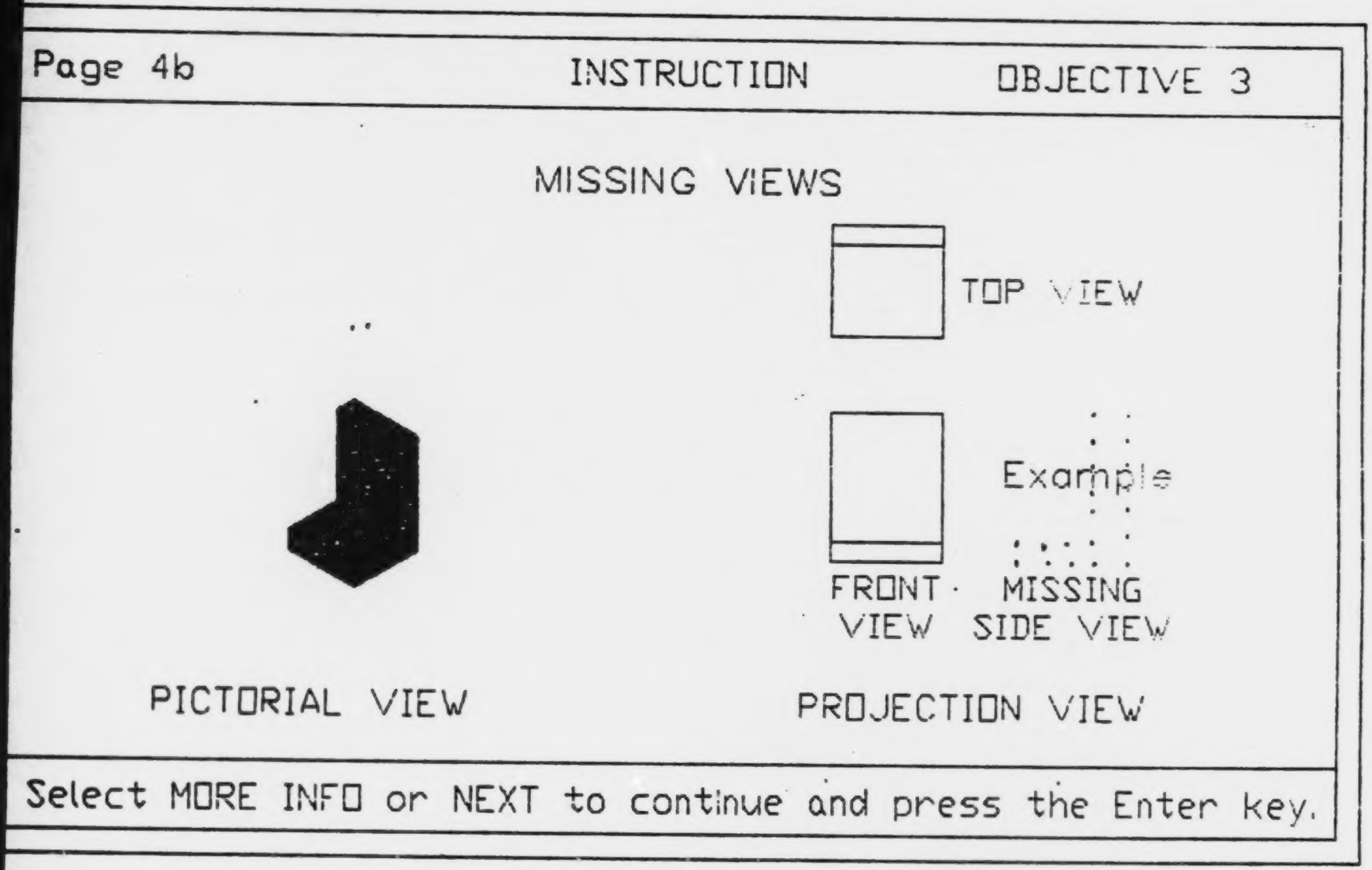


Page 4a INSTRUCTION OBJECTIVE 3

MISSING VIEWS

MISSING TOP VIEW
Example
TOP PLANE
FRONT & SIDE PLANE
FRONT VIEW
PICTORIAL VIEW
PROJECTION VIEW

Select MORE INFO or NEXT to continue and press the Enter key.

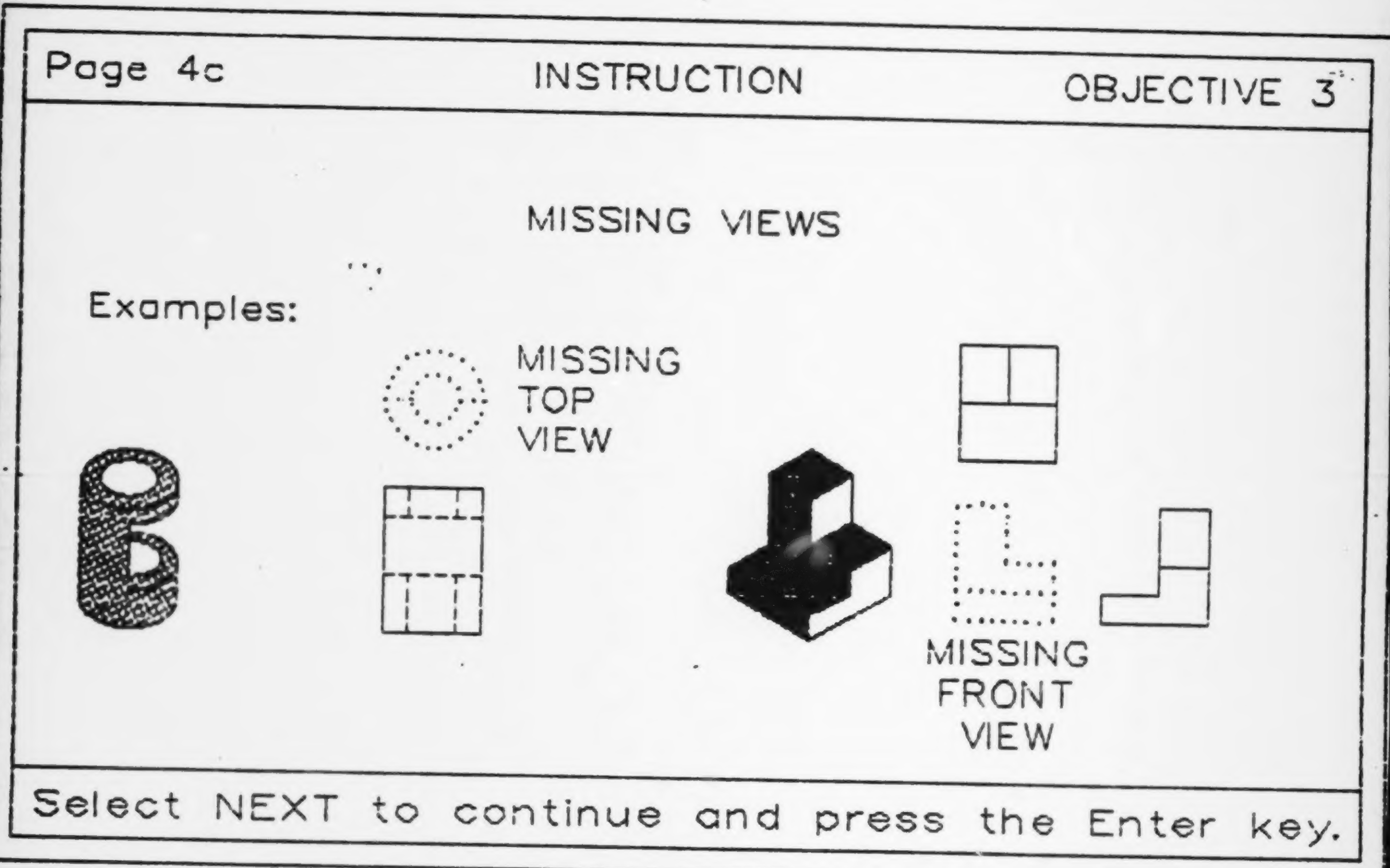


Page 4b INSTRUCTION OBJECTIVE 3

MISSING VIEWS

TOP VIEW
Example
FRONT VIEW
MISSING SIDE VIEW
PICTORIAL VIEW
PROJECTION VIEW

Select MORE INFO or NEXT to continue and press the Enter key.



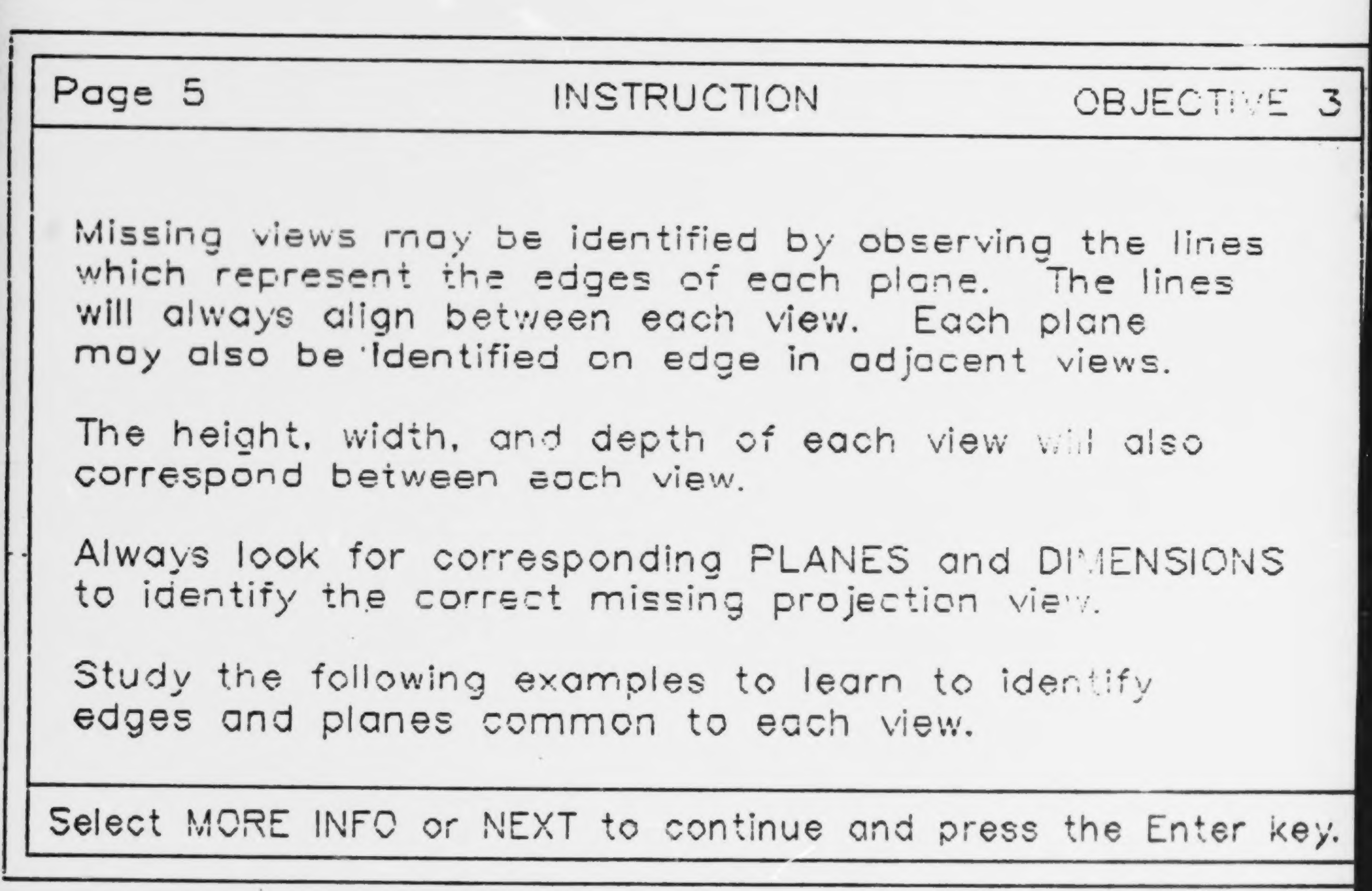
Page 4c INSTRUCTION OBJECTIVE 3

MISSING VIEWS

Examples:

MISSING
TOP
VIEW
MISSING
FRONT
VIEW

Select NEXT to continue and press the Enter key.



Page 5 INSTRUCTION OBJECTIVE 3

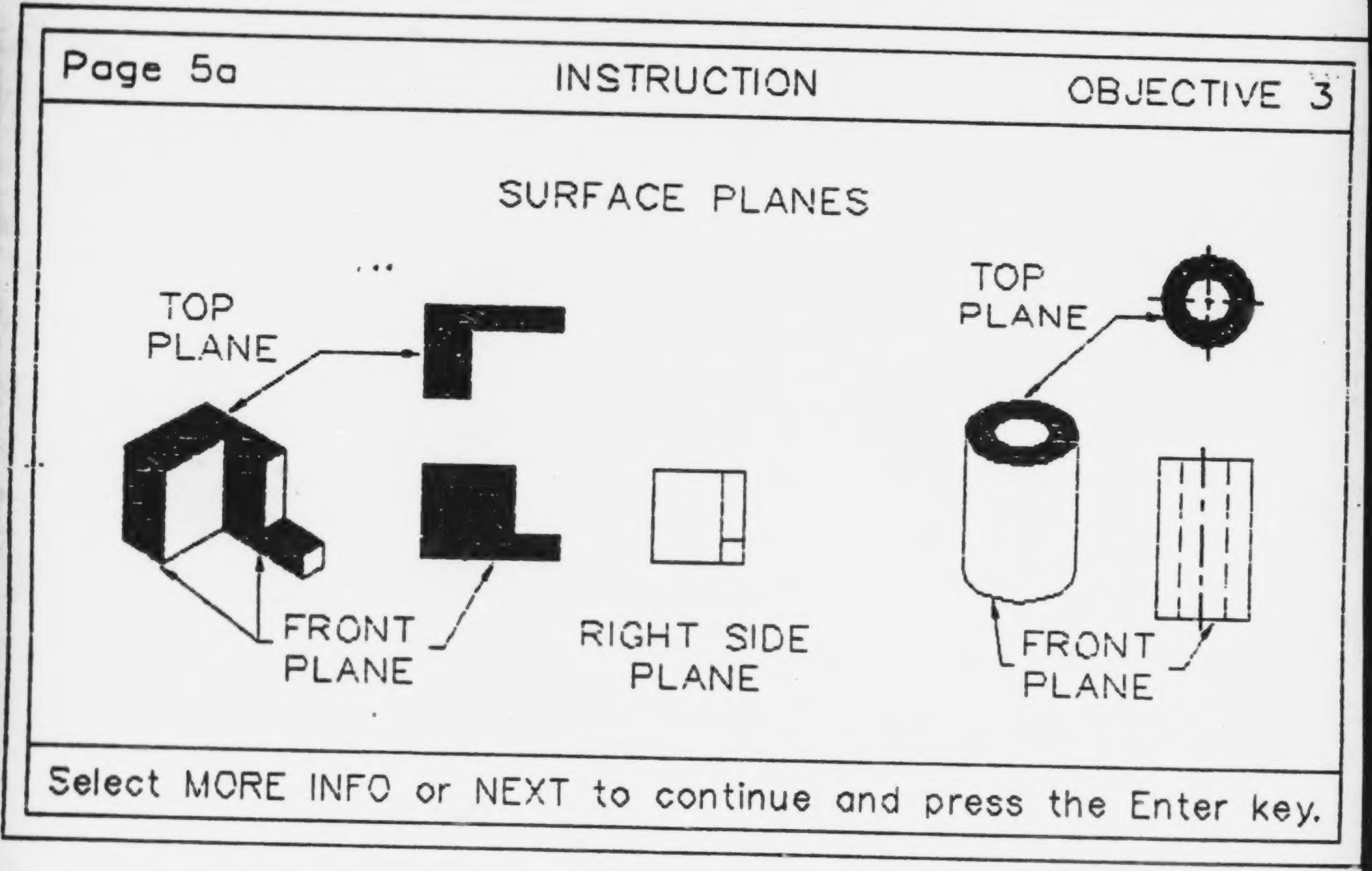
Missing views may be identified by observing the lines which represent the edges of each plane. The lines will always align between each view. Each plane may also be identified on edge in adjacent views.

The height, width, and depth of each view will also correspond between each view.

Always look for corresponding PLANES and DIMENSIONS to identify the correct missing projection view.

Study the following examples to learn to identify edges and planes common to each view.

Select MORE INFO or NEXT to continue and press the Enter key.

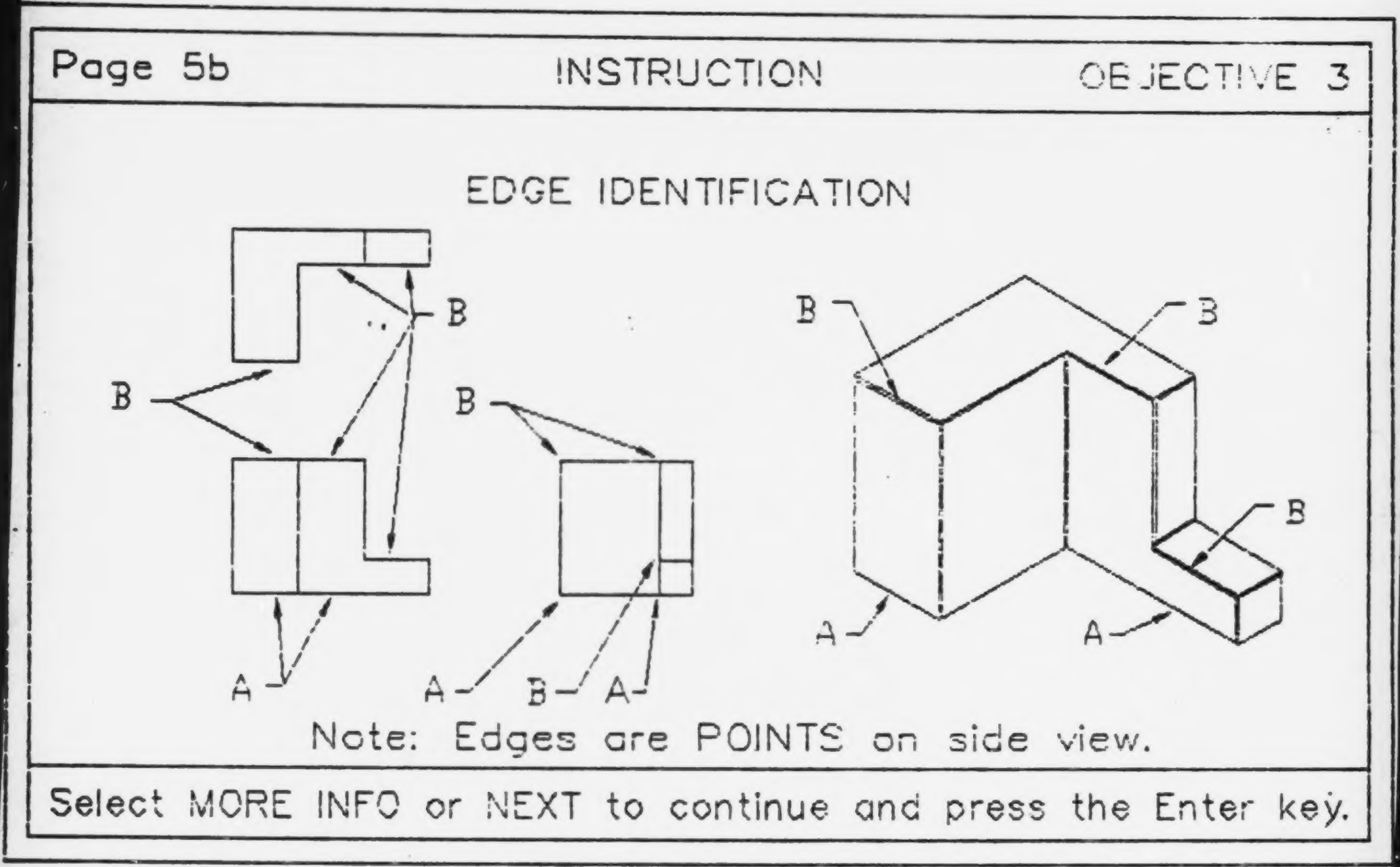


Page 5a INSTRUCTION OBJECTIVE 3

SURFACE PLANES

TOP PLANE
FRONT PLANE
RIGHT SIDE PLANE
TOP PLANE
FRONT PLANE

Select MORE INFO or NEXT to continue and press the Enter key.

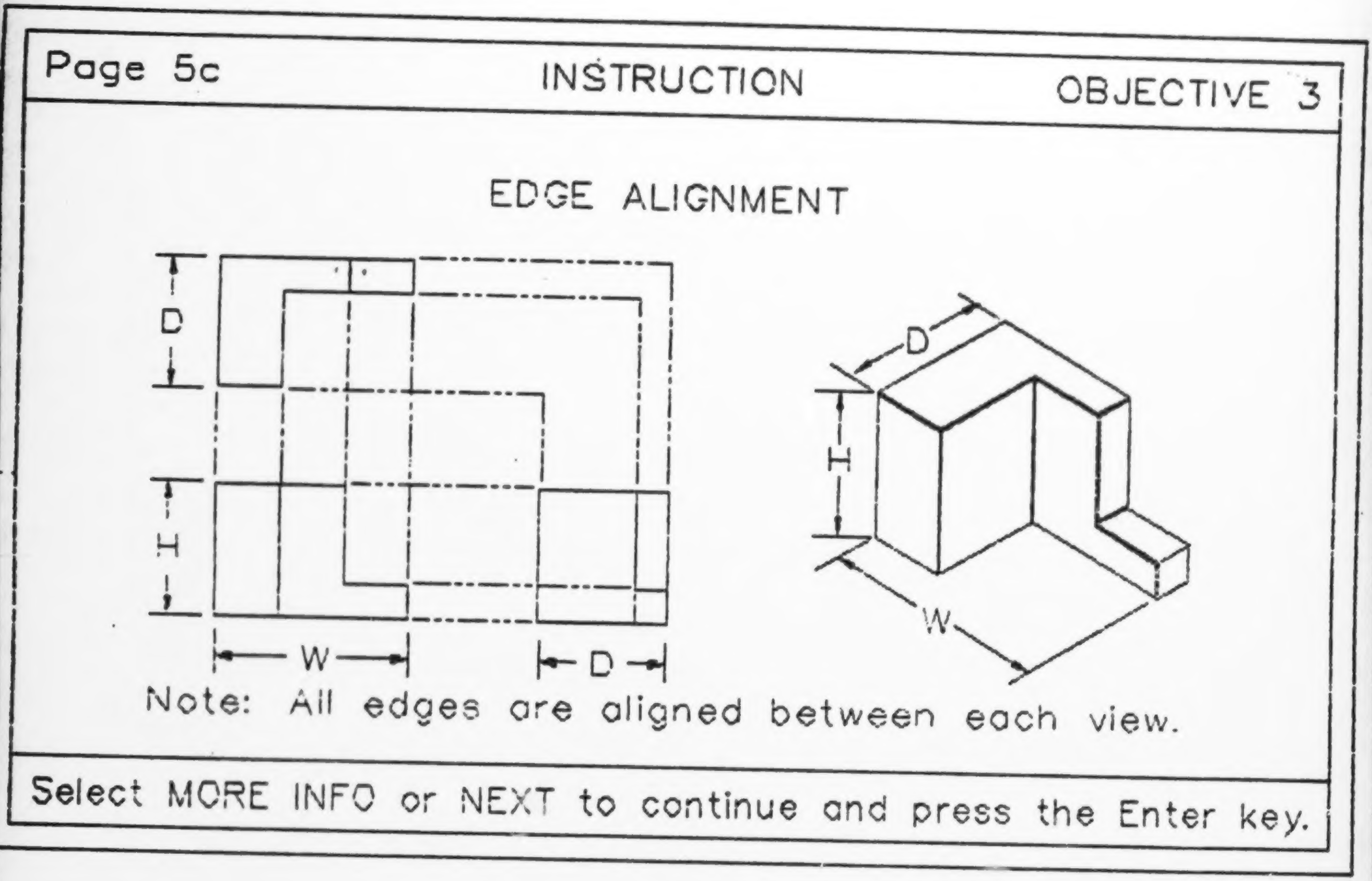


Page 5b INSTRUCTION OBJECTIVE 3

EDGE IDENTIFICATION

Note: Edges are POINTS on side view.

Select MORE INFO or NEXT to continue and press the Enter key.



Page 5c INSTRUCTION OBJECTIVE 3

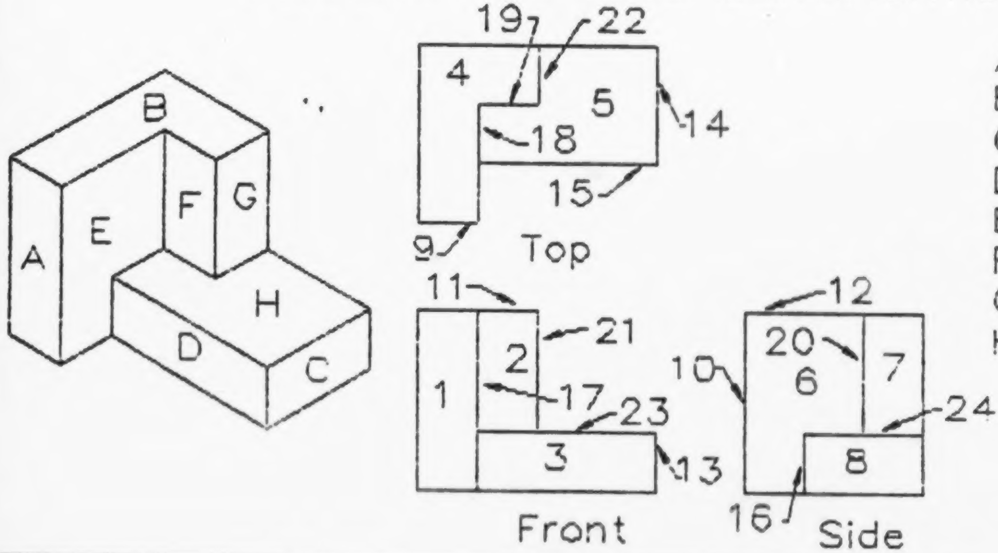
EDGE ALIGNMENT

Note: All edges are aligned between each view.

Select MORE INFO or NEXT to continue and press the Enter key.

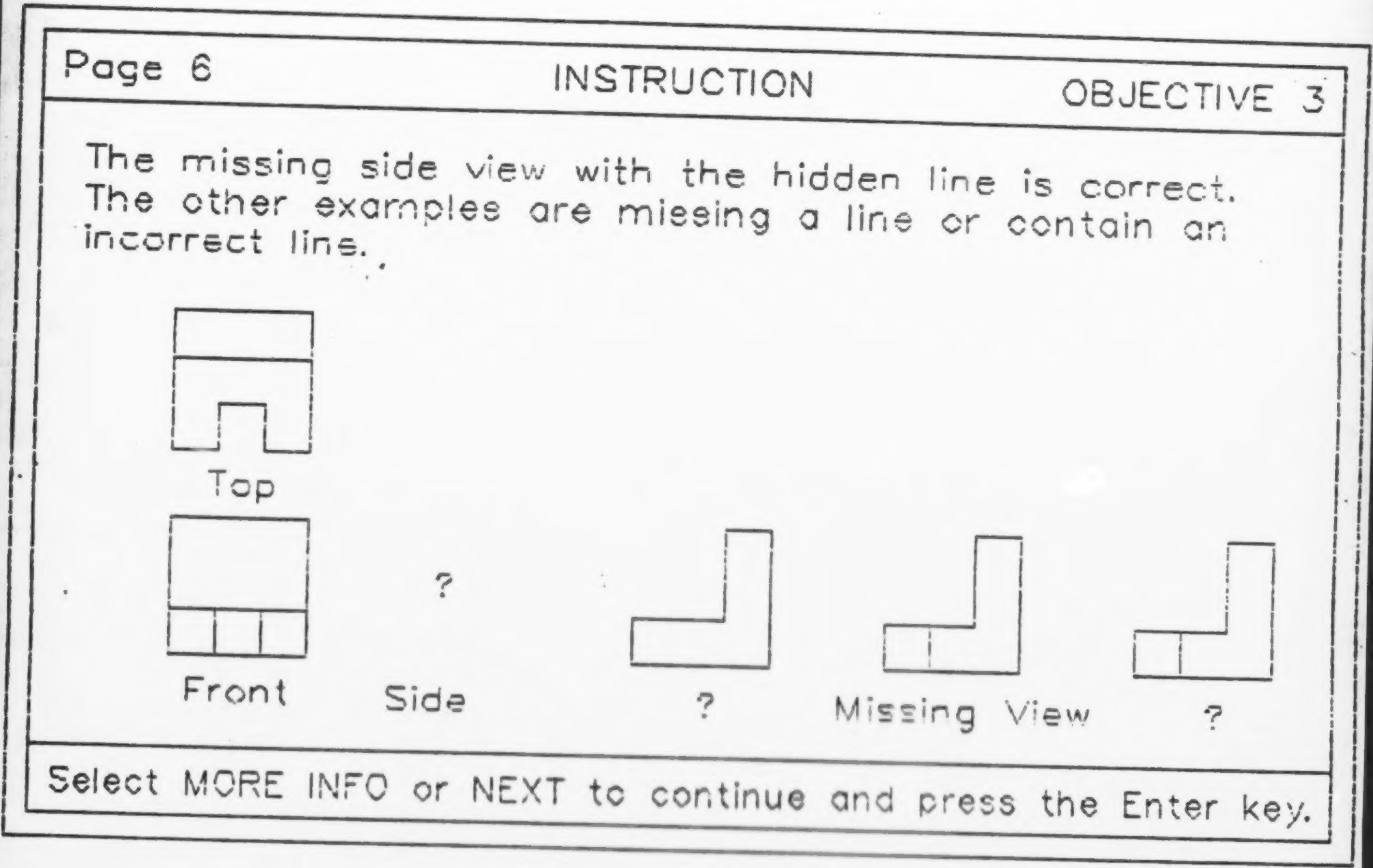
Page 5d INSTRUCTION OBJECTIVE 3

SURFACE AND EDGE IDENTIFICATION


B
A
E
F
G
H
D
C
19
22
4
5
18
14
15
9
Top
11
21
2
1
17
23
3
13
Front
12
20
6
7
10
24
8
16
Side

	F	T	S
A=	1	9	10
B=	11	4	12
C=	13	14	8
D=	3	15	16
E=	17	18	6
F=	2	19	20
G=	21	22	7
H=	23	5	24

Select NEXT to continue and press the Enter key.

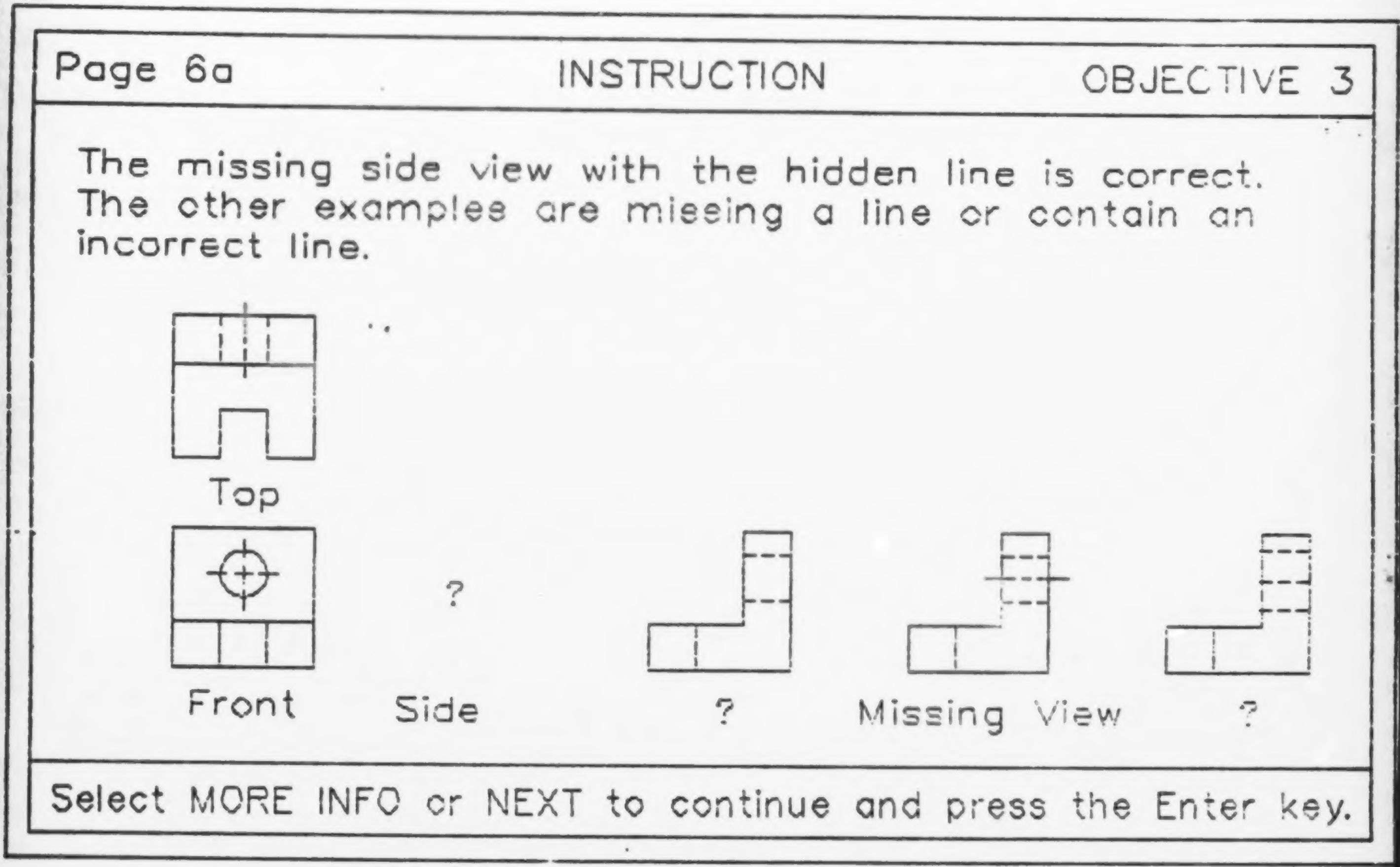


Page 6 INSTRUCTION OBJECTIVE 3

The missing side view with the hidden line is correct. The other examples are miesing a line or contain an incorrect line.

Top
Front
?
Side
?
Missing View
?

Select MORE INFO or NEXT to continue and press the Enter key.

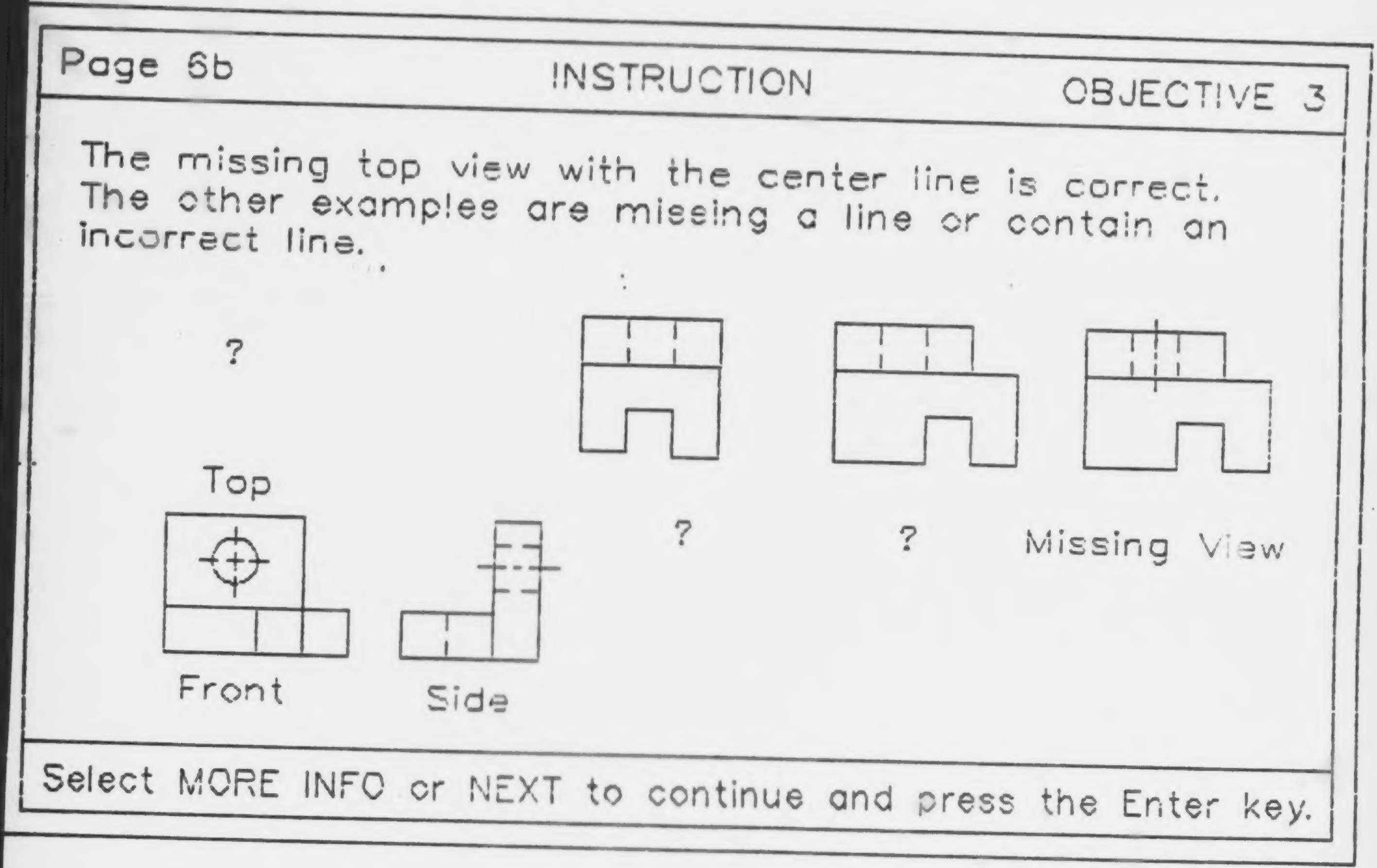


Top
Front
?
Side
?
Missing View
?

Page 6a INSTRUCTION OBJECTIVE 3

The missing side view with the hidden line is correct. The other examples are missing a line or contain an incorrect line.

Select MORE INFO or NEXT to continue and press the Enter key.

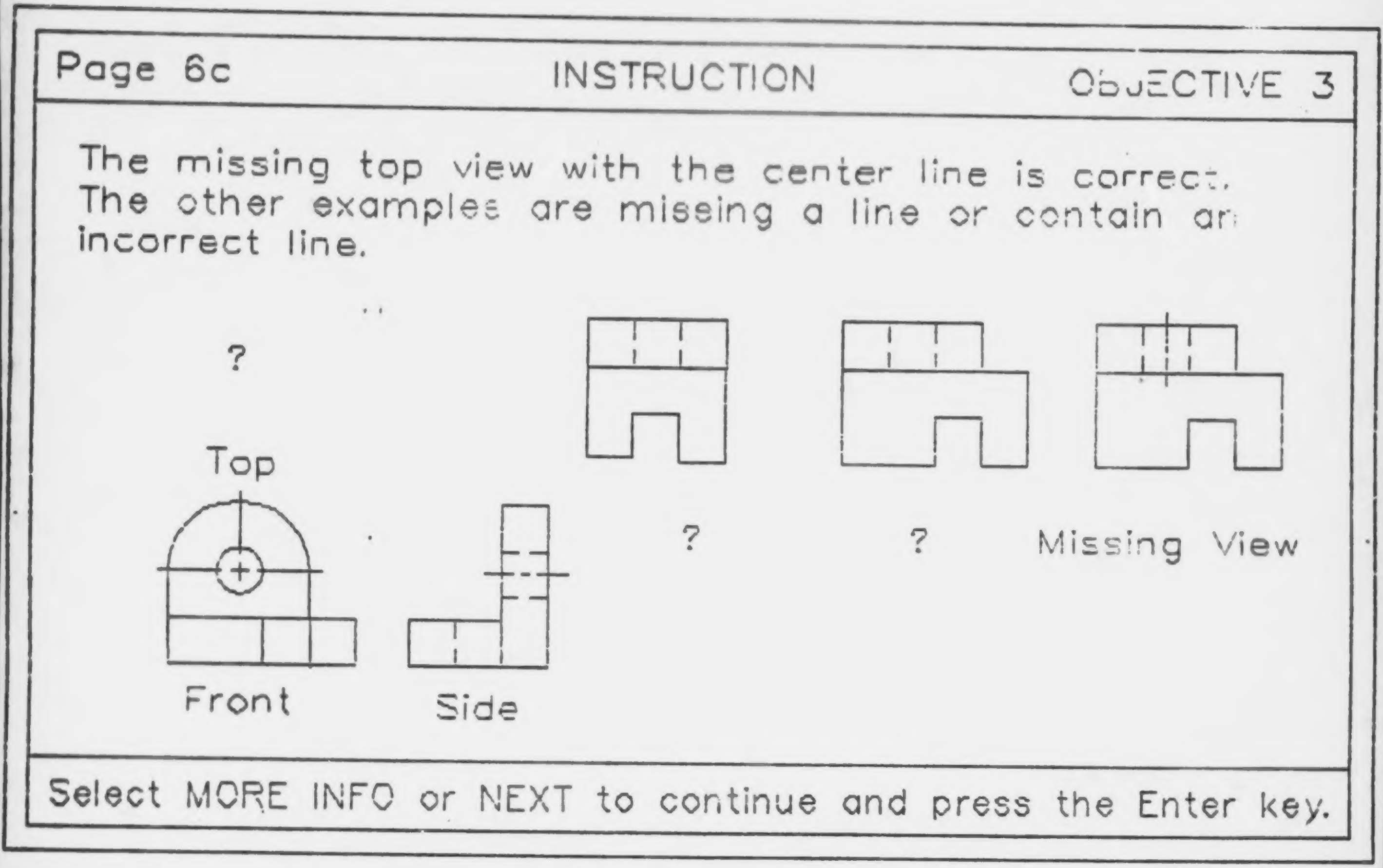


Page 6b INSTRUCTION OBJECTIVE 3

The missing top view with the center line is correct. The other examples are missing a line or contain an incorrect line.

?
Top
Front
Side
?
?
Missing View

Select MORE INFO or NEXT to continue and press the Enter key.

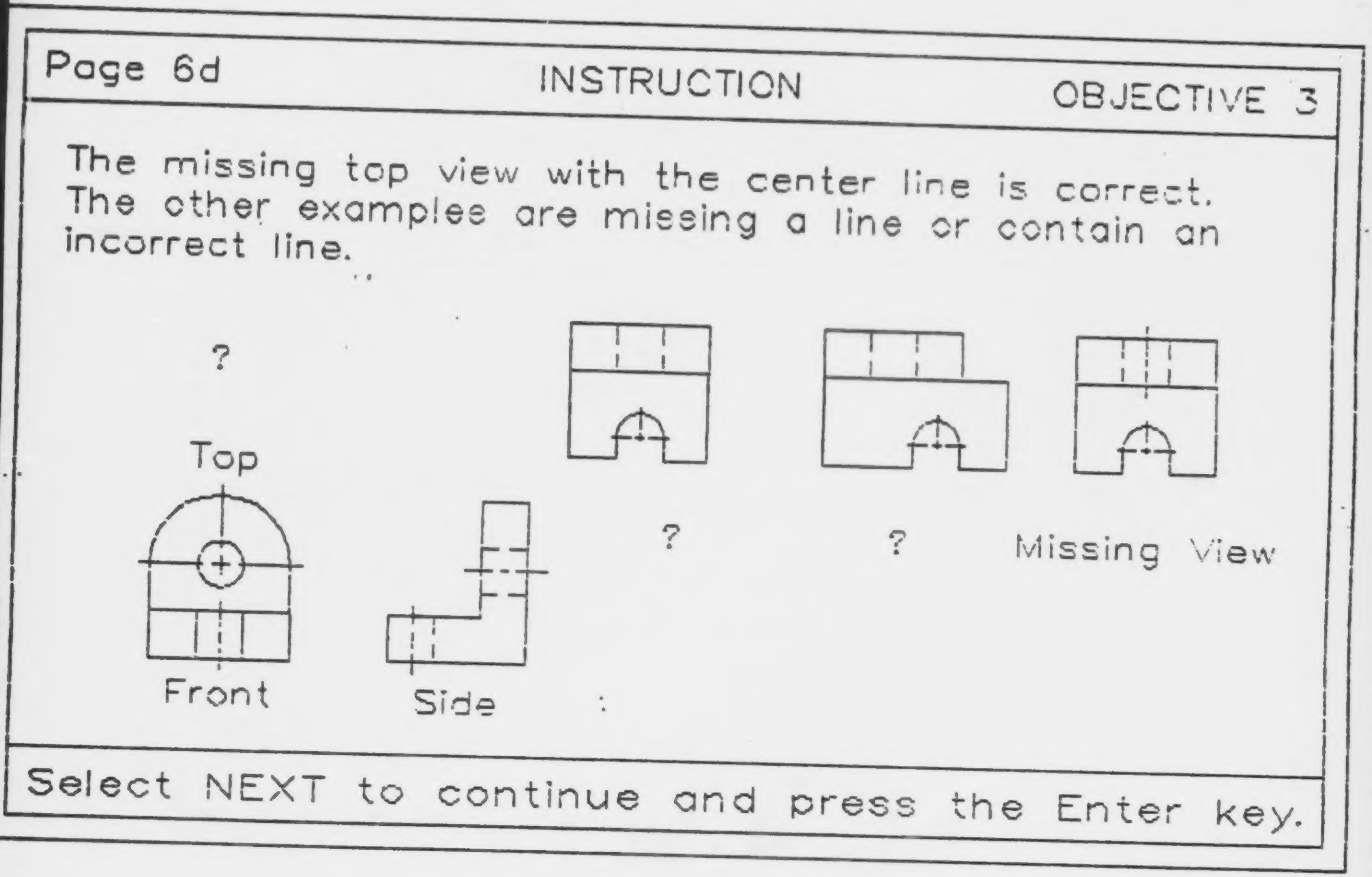


Page 6c INSTRUCTION OBJECTIVE 3

The missing top view with the center line is correct. The other examples are missing a line or contain an incorrect line.

?
Top
Front
Side
?
?
Missing View

Select MORE INFO or NEXT to continue and press the Enter key.

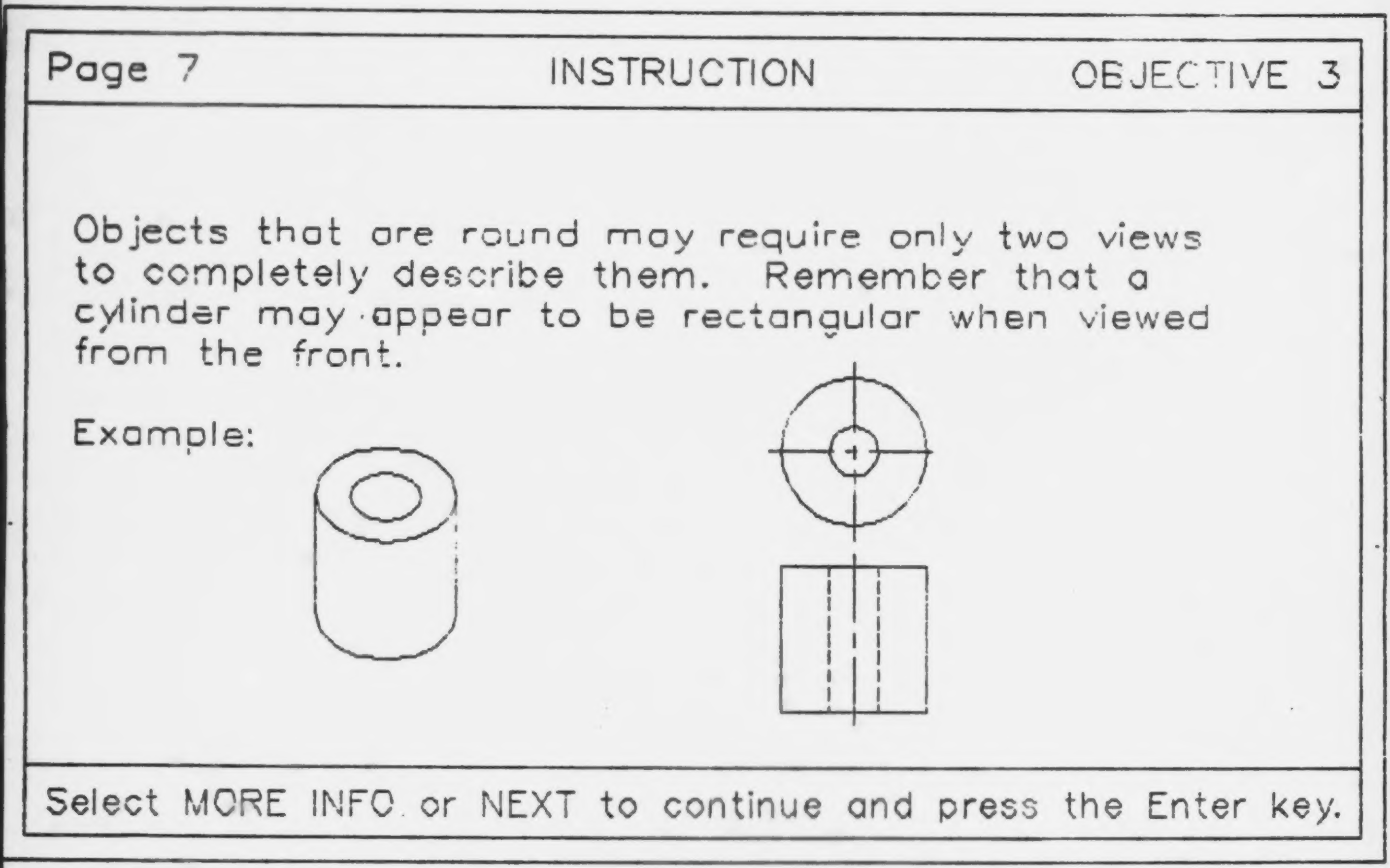


Page 6d INSTRUCTION OBJECTIVE 3

The missing top view with the center line is correct. The other examples are missing a line or contain an incorrect line.

?
Top
Front
Side
?
?
Missing View

Select NEXT to continue and press the Enter key.

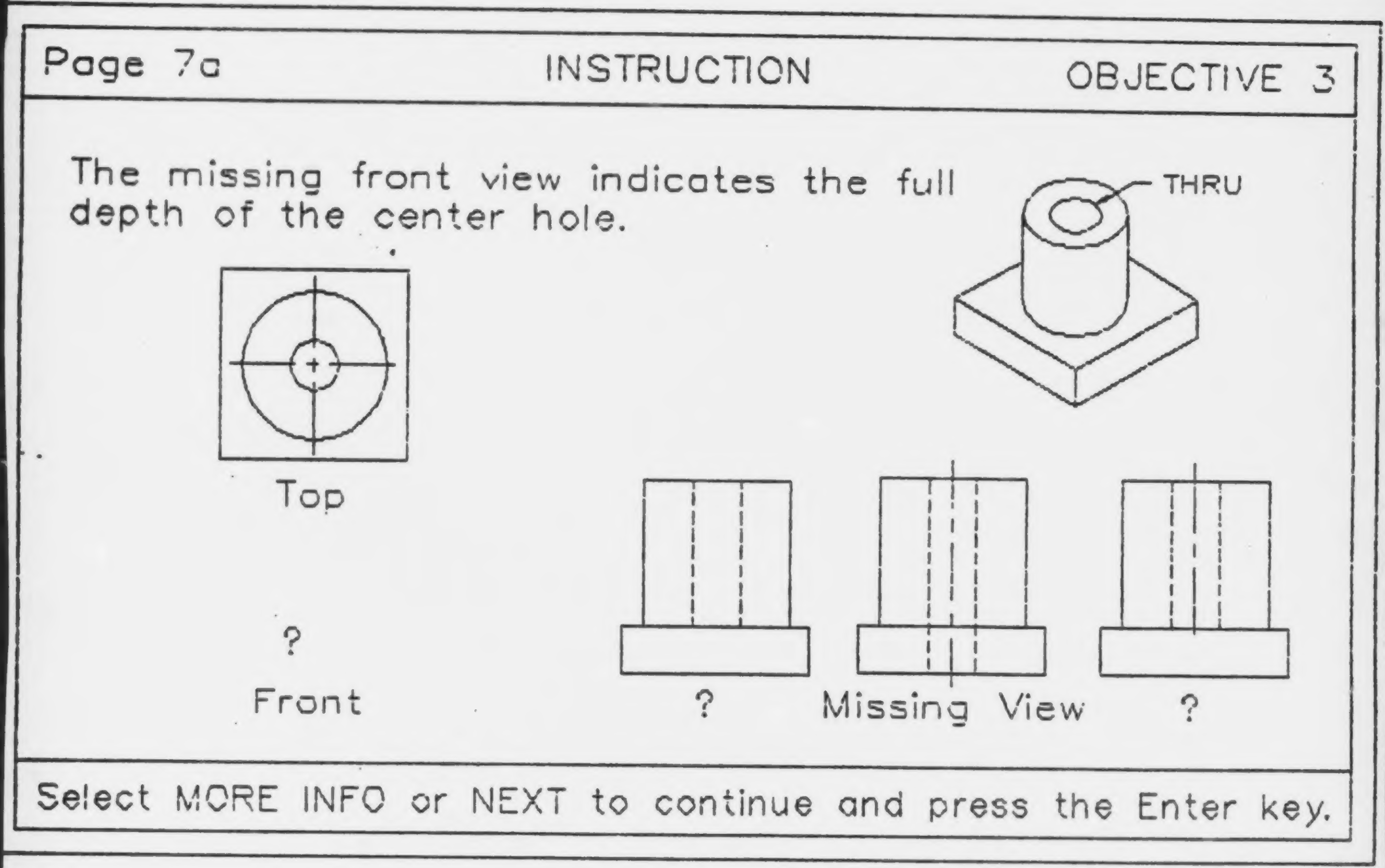


Page 7 INSTRUCTION OBJECTIVE 3

Objects that are round may require only two views to completely describe them. Remember that a cylinder may appear to be rectangular when viewed from the front.

Example:

Select MORE INFO or NEXT to continue and press the Enter key.



Page 7a INSTRUCTION OBJECTIVE 3

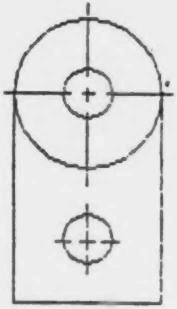
The missing front view indicates the full depth of the center hole.

THRU
Top
?
Front
?
Missing View
?

Select MORE INFO or NEXT to continue and press the Enter key.

Page 7b INSTRUCTION OBJECTIVE 3.

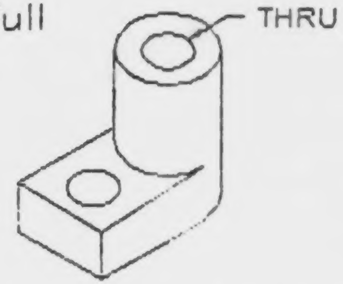
The missing front view indicates the full depth of the center hole.

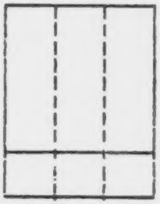


Top

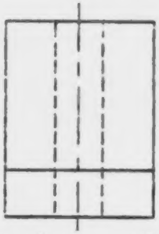
?

Front

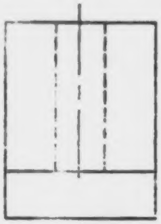




?

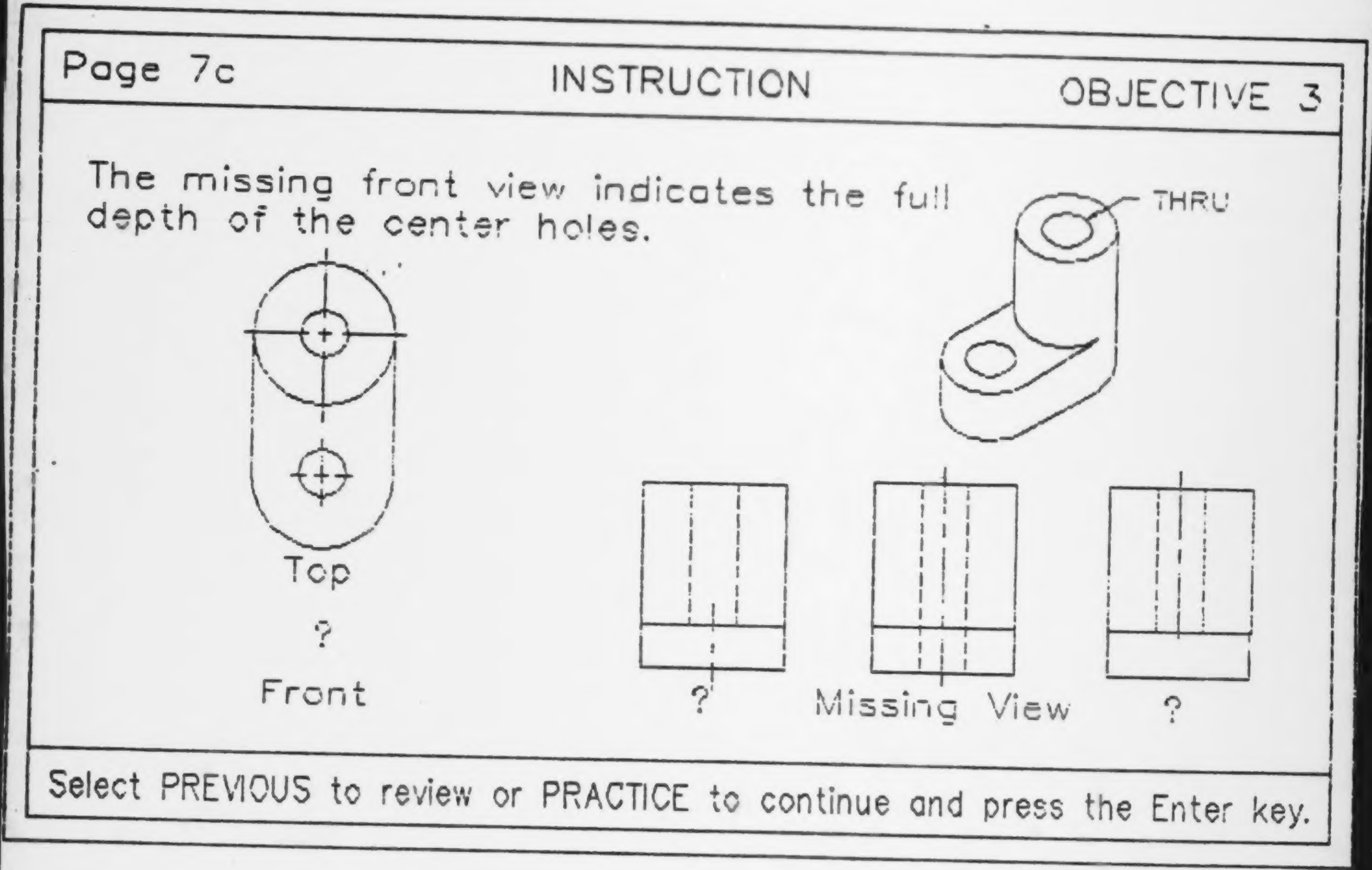


Missing View



?

Select MORE INFO or NEXT to continue and press the Enter key.

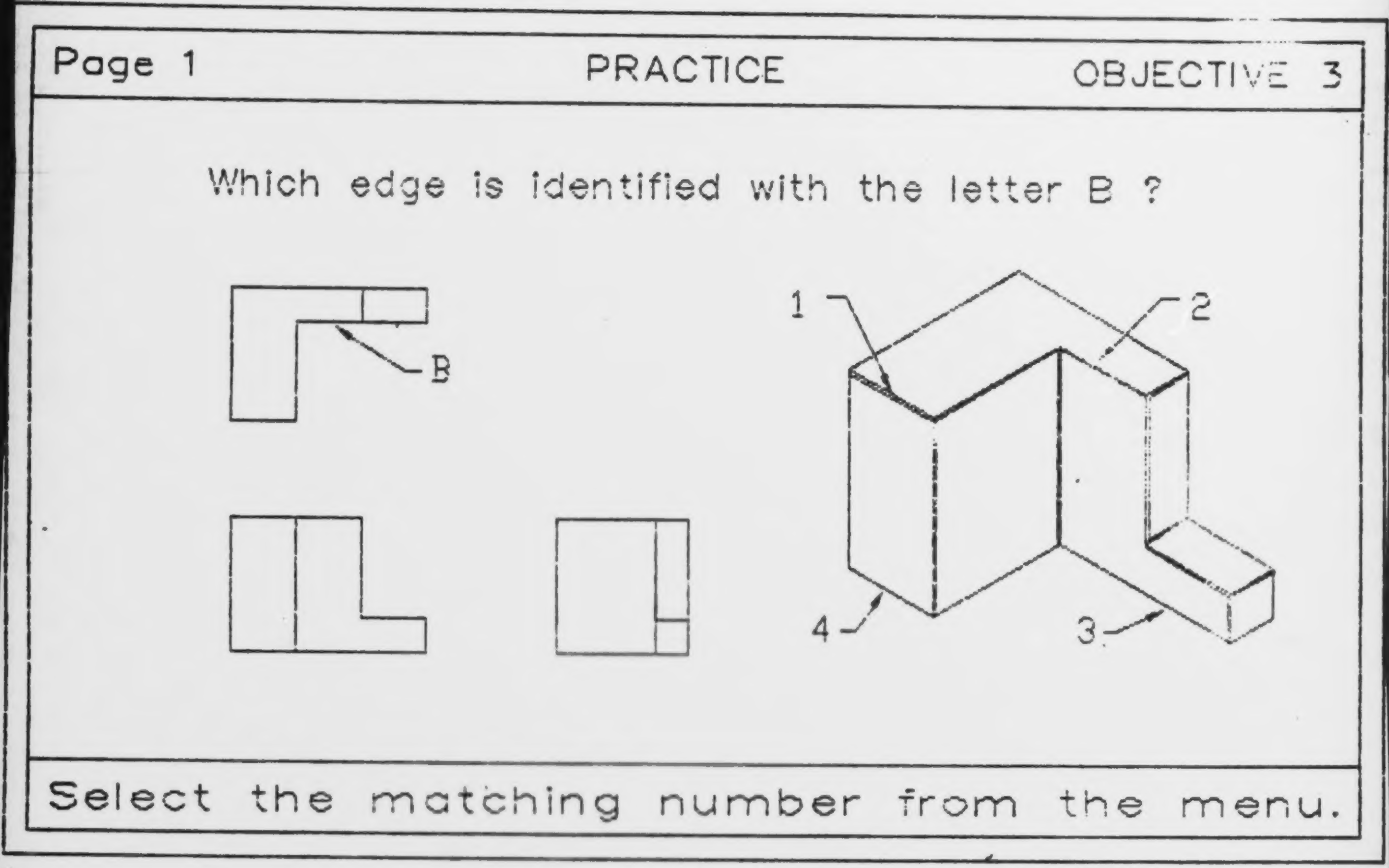


Page 7c INSTRUCTION OBJECTIVE 3

The missing front view indicates the full depth of the center holes.

THRU
Top
?
Front
?
Missing View
?

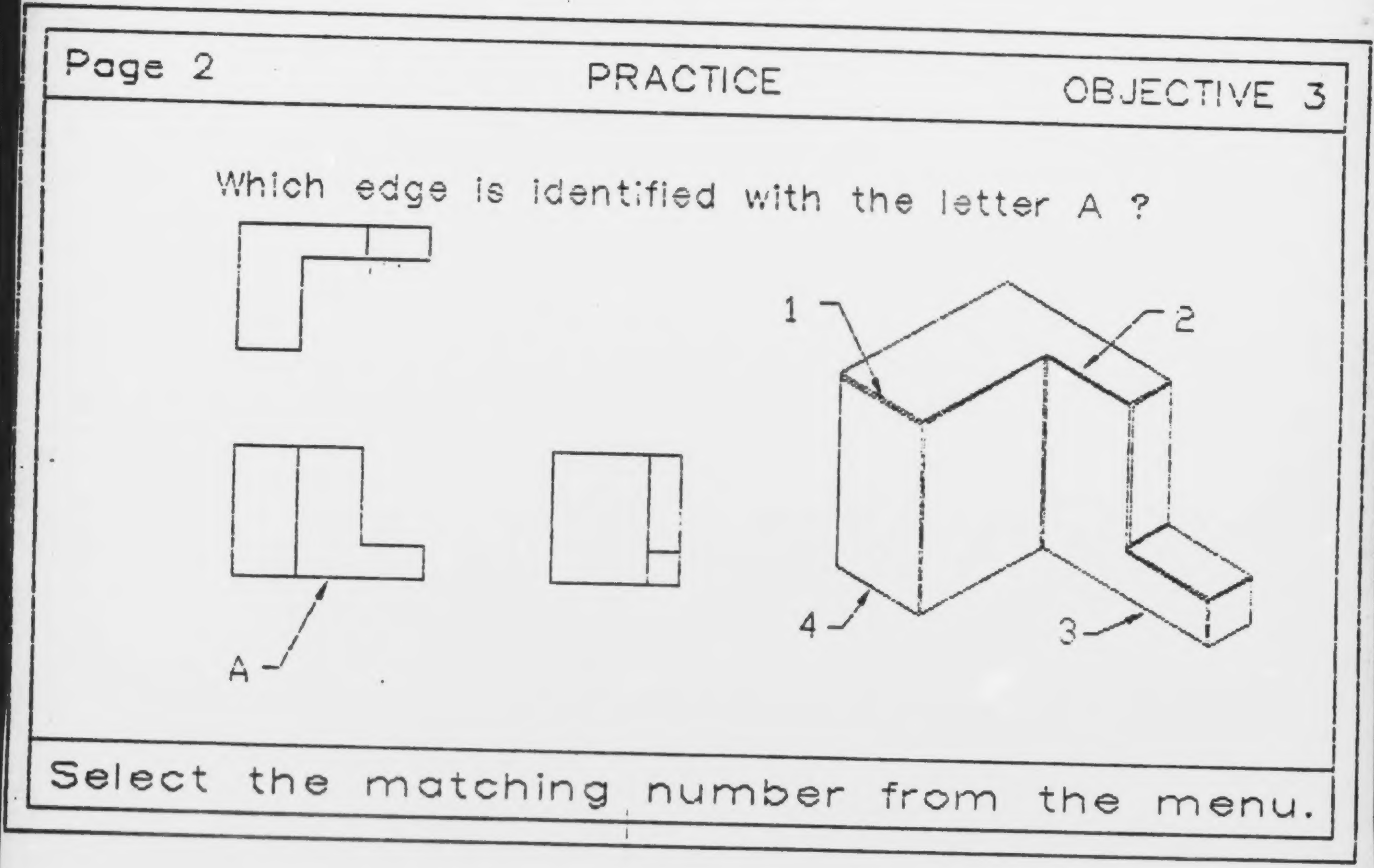
Select PREVIOUS to review or PRACTICE to continue and press the Enter key.



Page 1 PRACTICE OBJECTIVE 3

Which edge is identified with the letter B ?

Select the matching number from the menu.



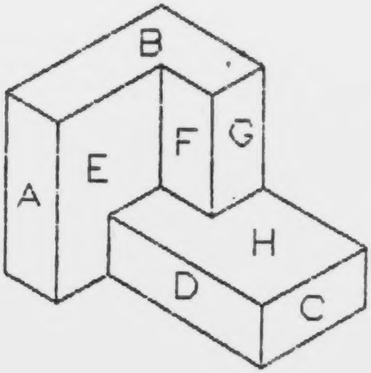
Page 2 PRACTICE OBJECTIVE 3

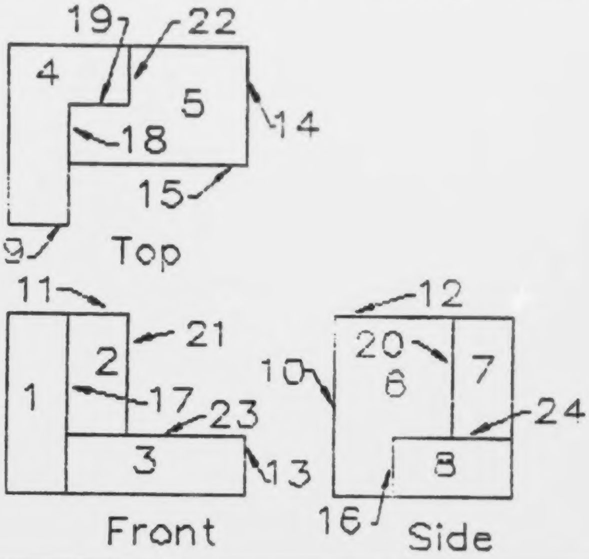
Which edge is identified with the letter A ?

Select the matching number from the menu.

Page 3 PRACTICE OBJECTIVE 3

Which surface plane is identified by F=17, T=18, S=6 ?

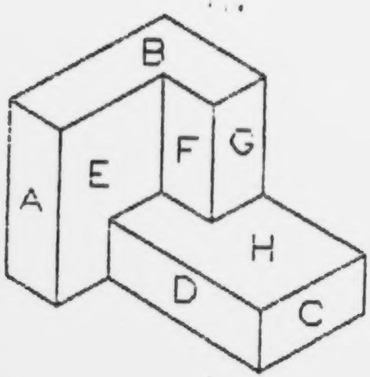


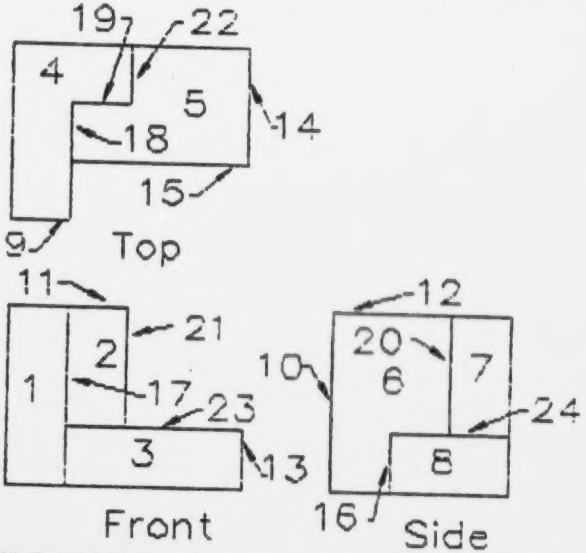

19
22
4
5
18
14
15
9
Top
11
12
21
2
20
6
7
10
1
17
23
24
3
13
8
16
Front
Side

Select the missing letter from the menu.

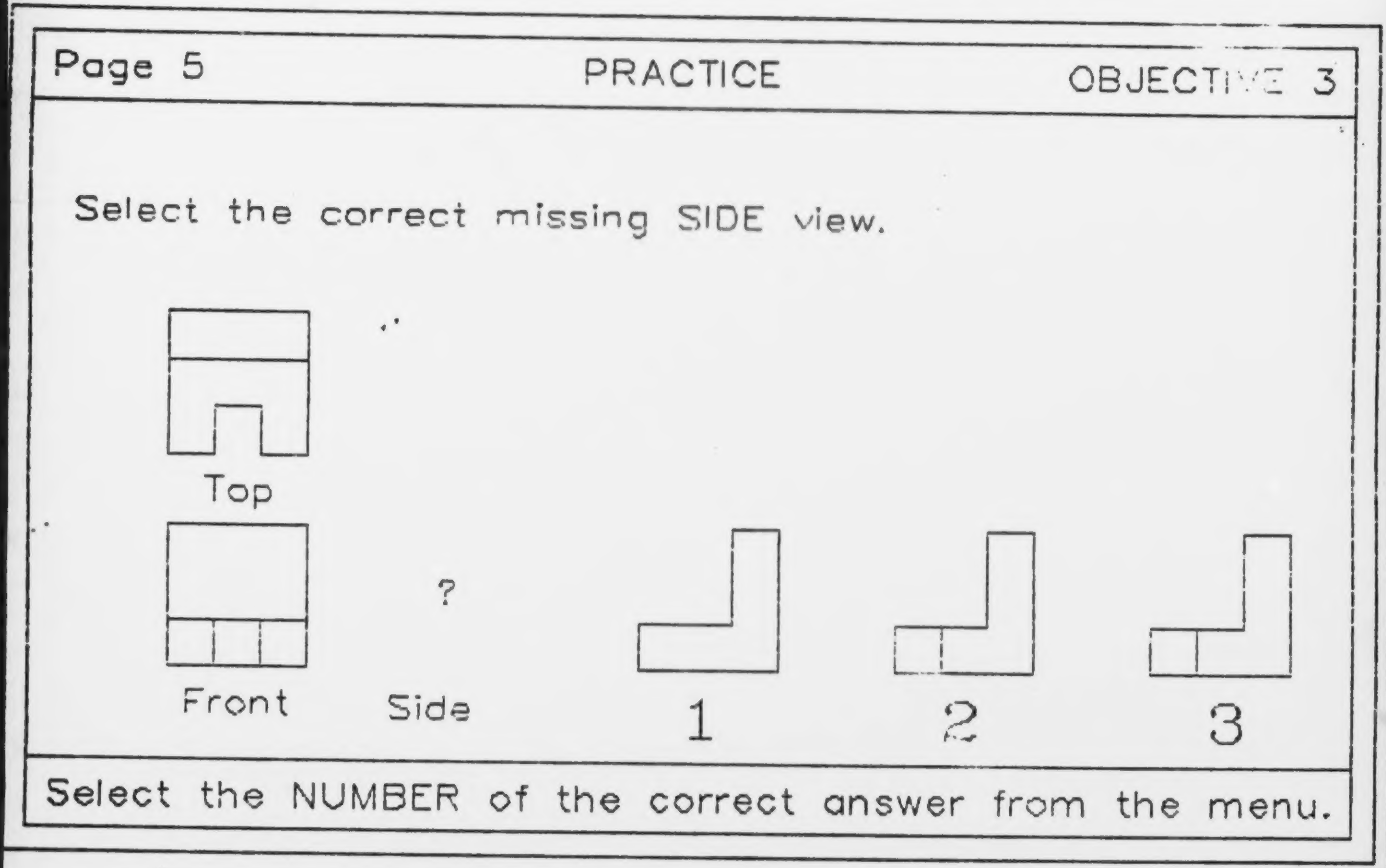
Page 4 PRACTICE OBJECTIVE 3

Which surface plane is identified by F=11, T=4, S=12 ?




19
22
4
5
14
18
15
9
Top
11
21
2
1
17
23
3
13
Front
12
20
7
6
10
24
8
16
Side

Select the LETTER that identifies the correct plane.

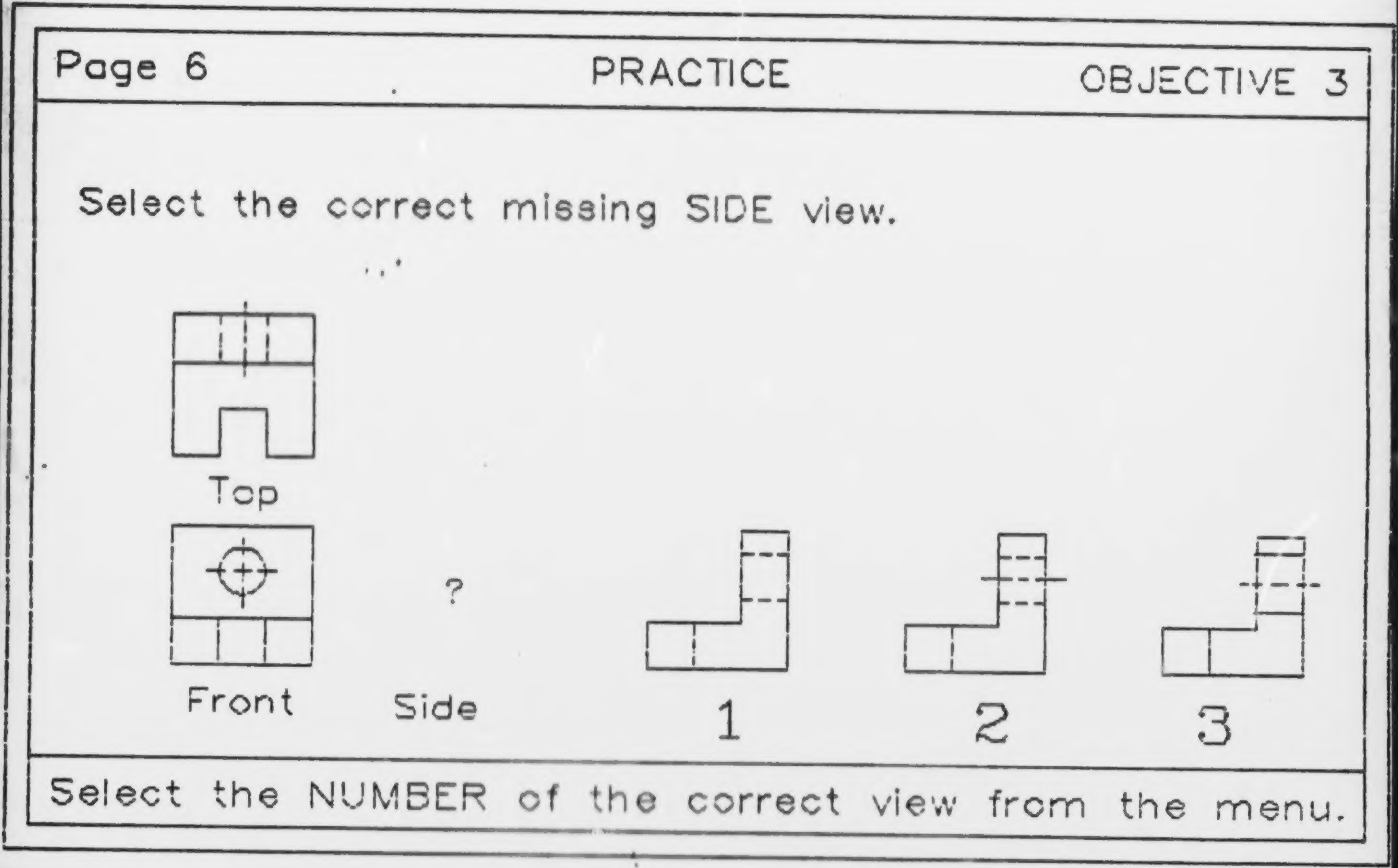


Page 5 PRACTICE OBJECTIVE 3

Select the correct missing SIDE view.

Top
Front
?
Side
1
2
3

Select the NUMBER of the correct answer from the menu.



Page 6 PRACTICE OBJECTIVE 3

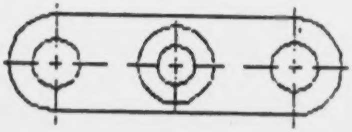
Select the correct missing SIDE view.

Top
Front
?
Side
1
2
3

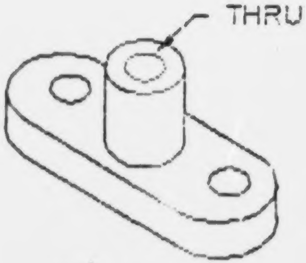
Select the NUMBER of the correct view from the menu.

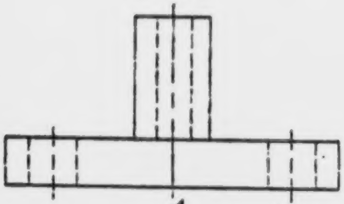
Page 7 PRACTICE OBJECTIVE 3

Select the correct missing FRONT VIEW.

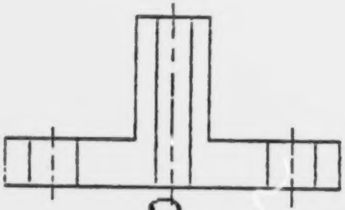


Top

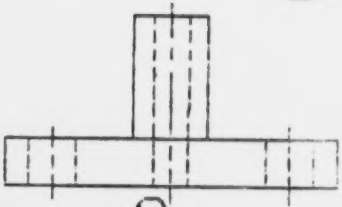




1



2



3

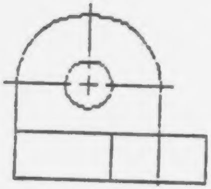
Select the NUMBER of the correct view from the menu.

Page 8 PRACTICE OBJECTIVE 3

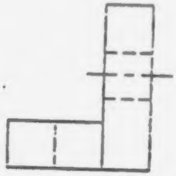
Select the correct missing TOP VIEW.

?

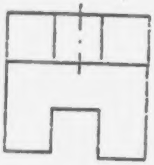
Top



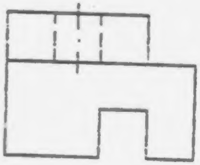
Front



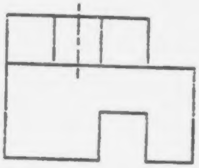
Side



1

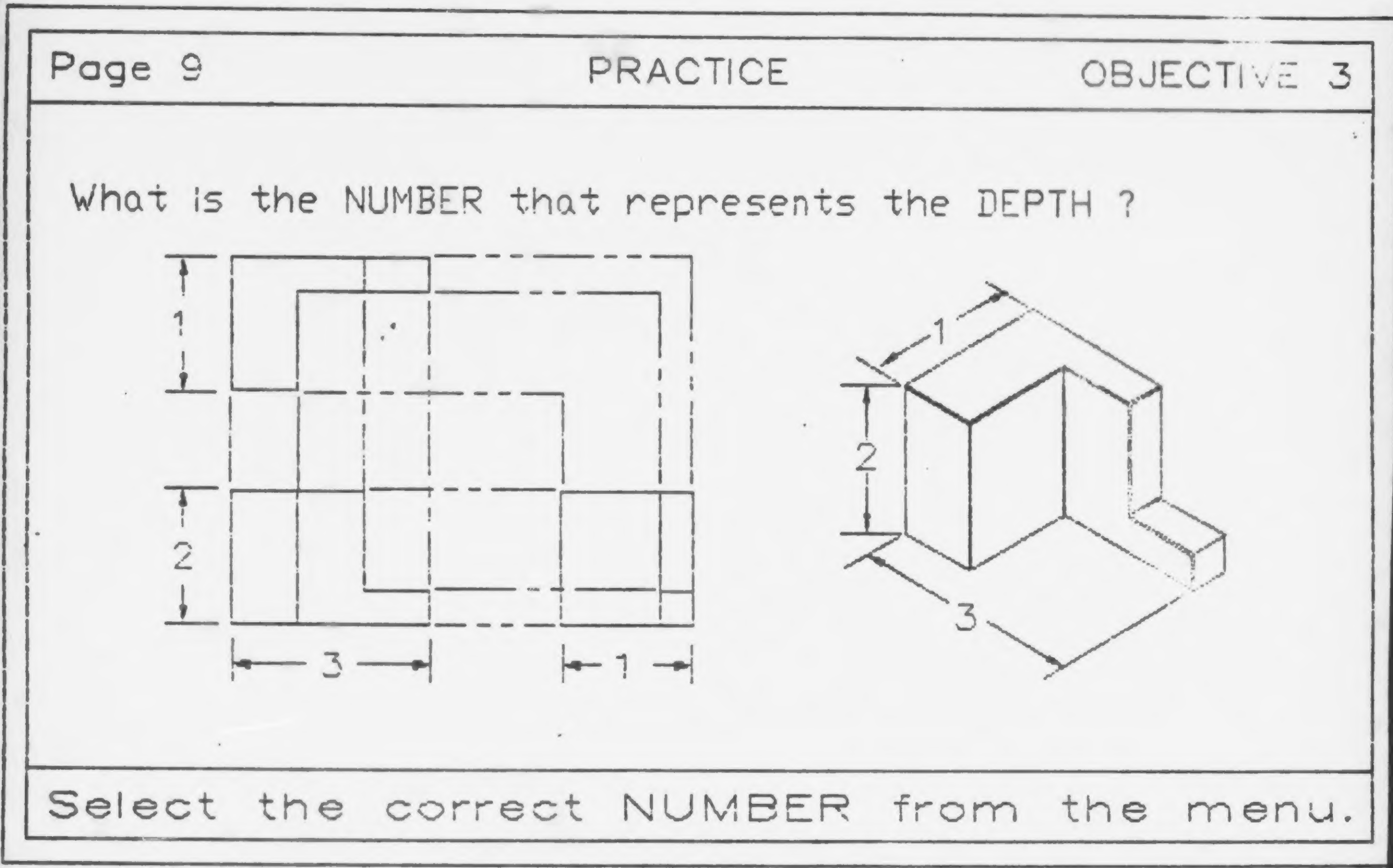


2



3

Select the NUMBER of the correct view from the menu.



Page 9 PRACTICE OBJECTIVE 3

What is the NUMBER that represents the DEPTH ?

Select the correct NUMBER from the menu.

TEXAS STATE TECHNICAL INSTITUTE

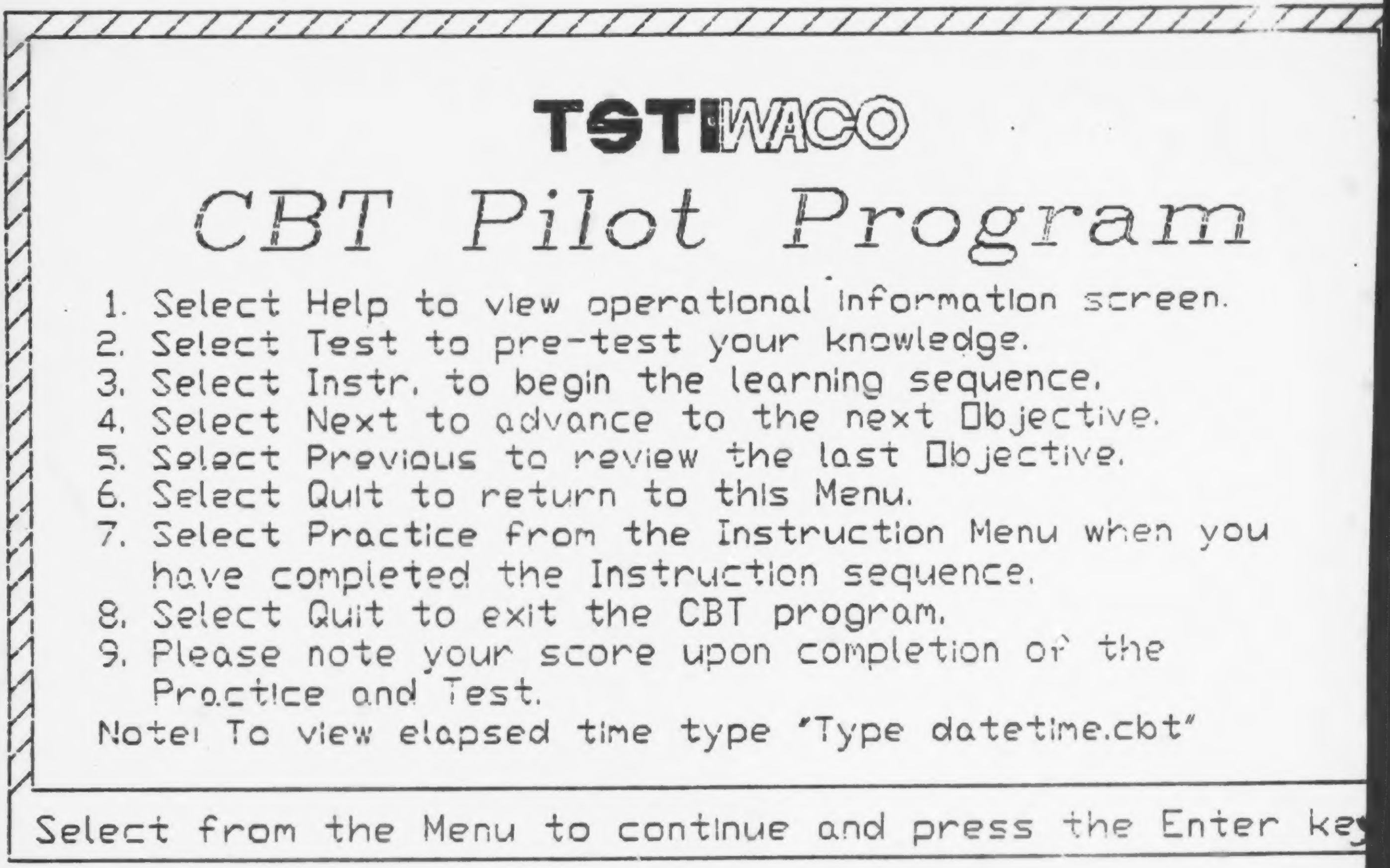
TSTI WACO

PRESENTS

A

CBT Pilot Program

Designed by Mardelle A. Sauer
Through a grant by the Coordinating Board
Texas College & University System



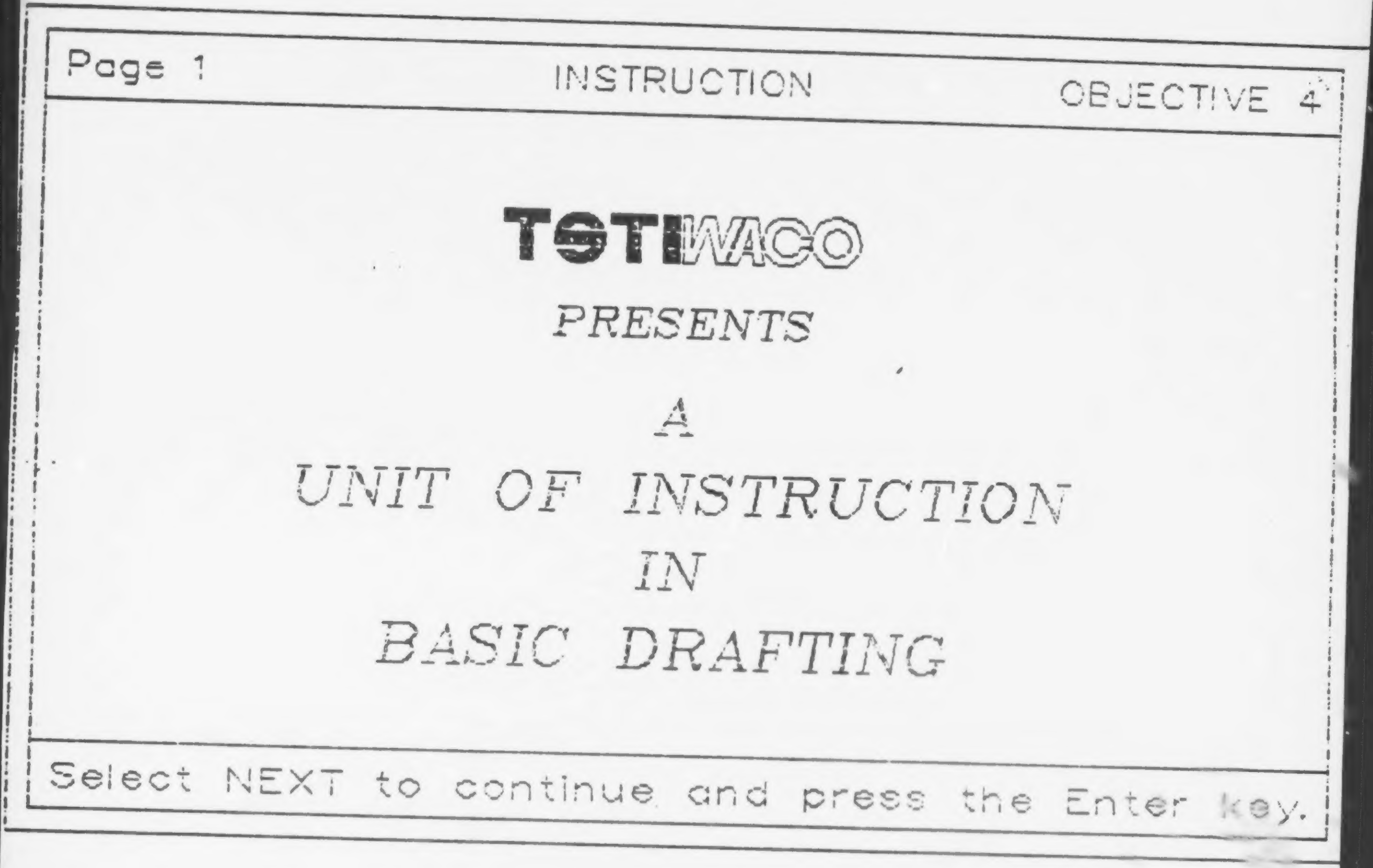
TSTI WACO

CBT Pilot Program

1. Select Help to view operational information screen.
2. Select Test to pre-test your knowledge.
3. Select Instr. to begin the learning sequence.
4. Select Next to advance to the next Objective.
5. Select Previous to review the last Objective.
6. Select Quit to return to this Menu.
7. Select Practice from the Instruction Menu when you have completed the Instruction sequence.
8. Select Quit to exit the CBT program.
9. Please note your score upon completion of the Practice and Test.

Note: To view elapsed time type "Type datetime.cbt"

Select from the Menu to continue and press the Enter ke



Page 1 INSTRUCTION OBJECTIVE 4

TSTI WACO

PRESENTS

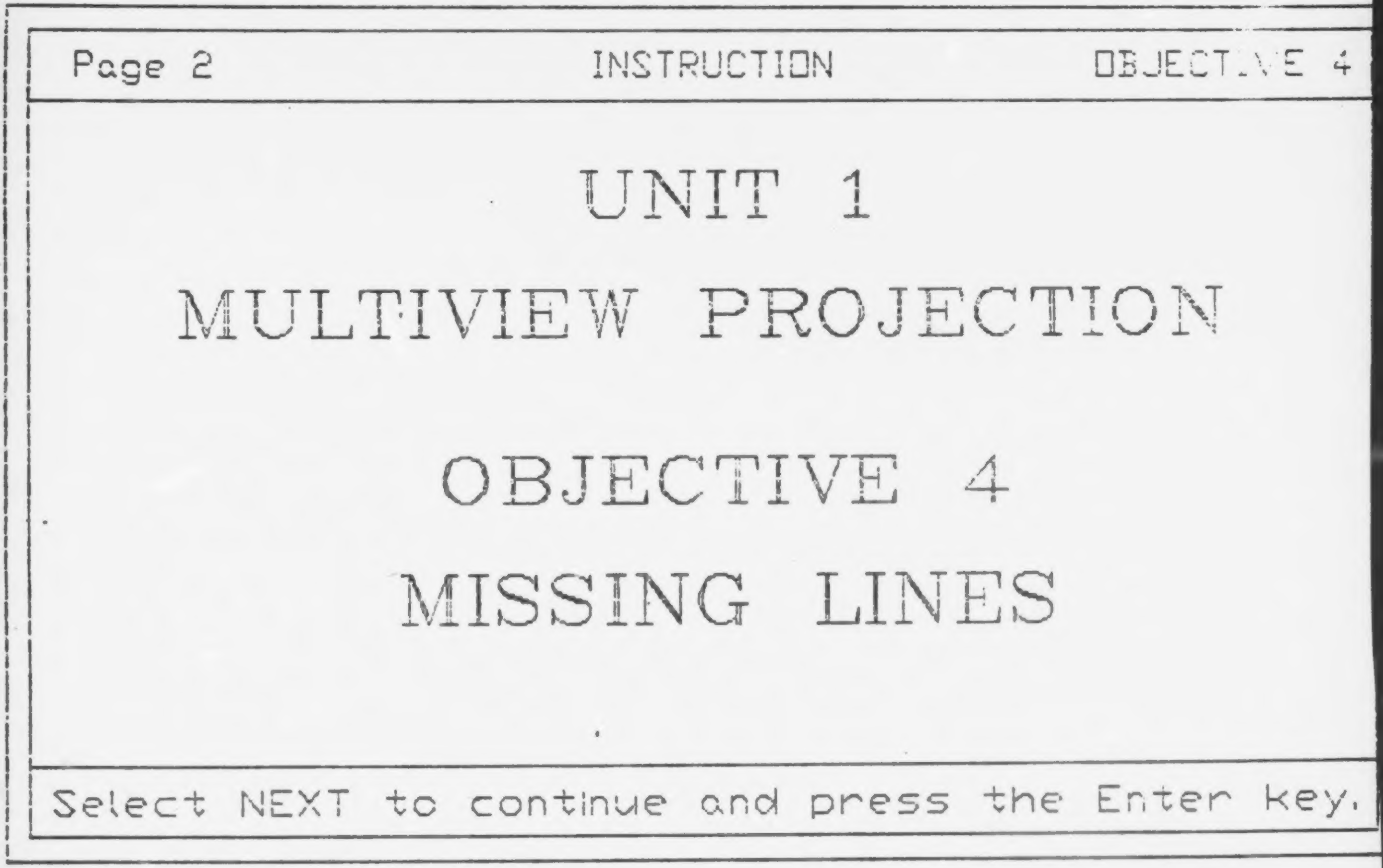
A

UNIT OF INSTRUCTION

IN

BASIC DRAFTING

Select NEXT to continue and press the Enter key.



Page 2 INSTRUCTION OBJECTIVE 4

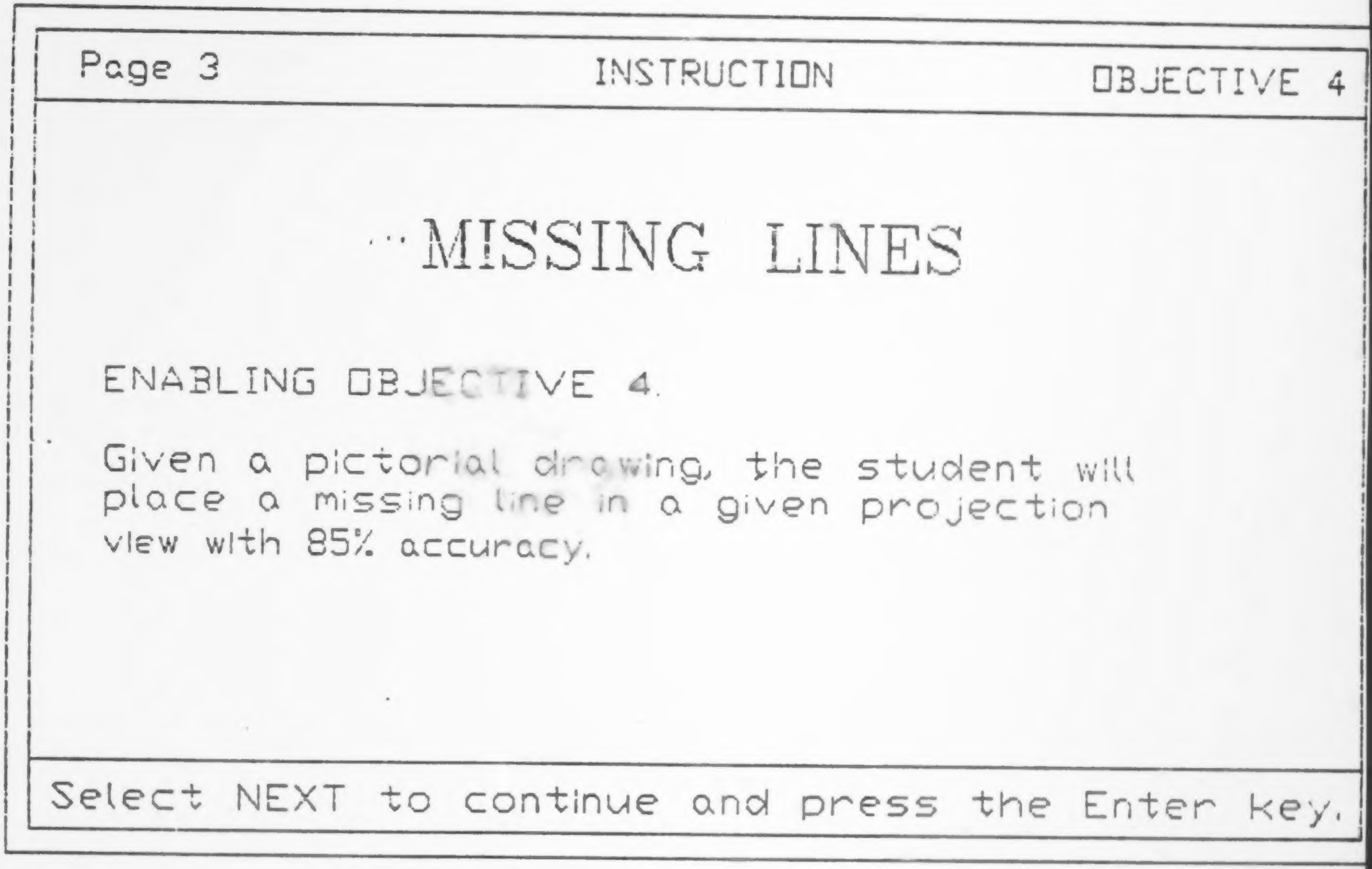
UNIT 1

MULTIVIEW PROJECTION

OBJECTIVE 4

MISSING LINES

Select NEXT to continue and press the Enter key.



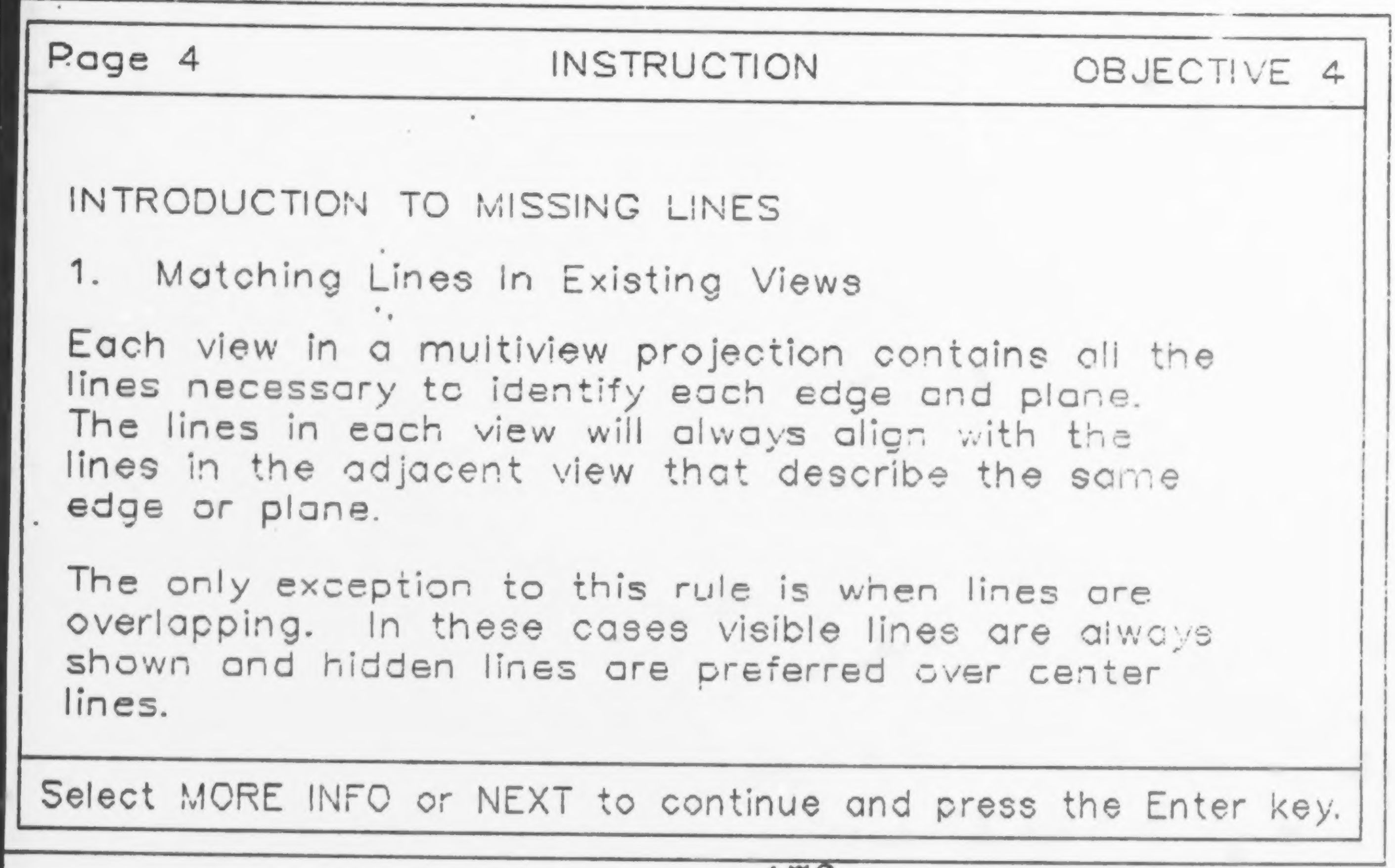
Page 3 INSTRUCTION OBJECTIVE 4

MISSING LINES

ENABLING OBJECTIVE 4.

Given a pictorial drawing, the student will place a missing line in a given projection view with 85% accuracy.

Select NEXT to continue and press the Enter key.



Page 4 INSTRUCTION OBJECTIVE 4

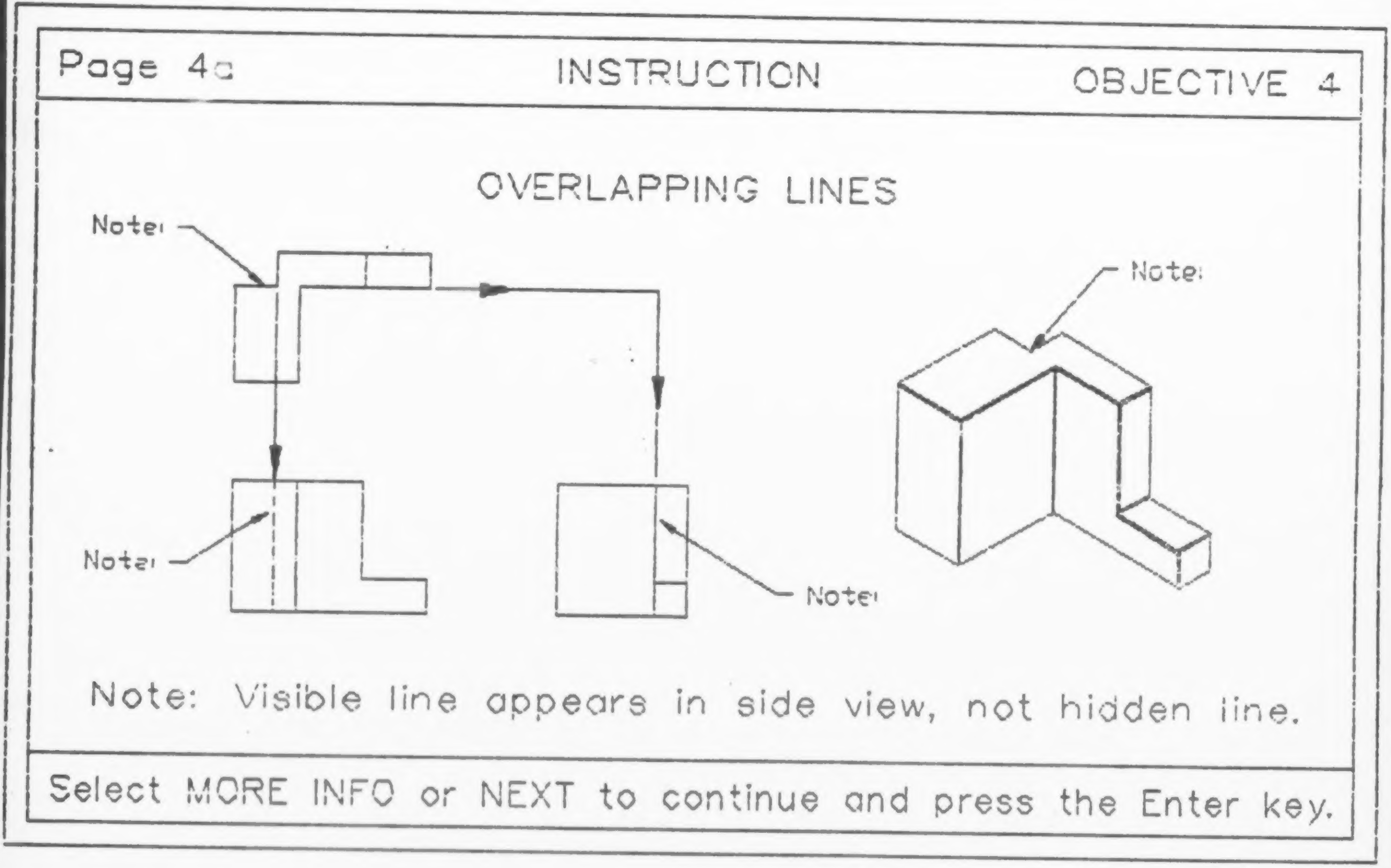
INTRODUCTION TO MISSING LINES

1. Matching Lines In Existing Views

Each view in a multiview projection contains all the lines necessary to identify each edge and plane. The lines in each view will always align with the lines in the adjacent view that describe the same edge or plane.

The only exception to this rule is when lines are overlapping. In these cases visible lines are always shown and hidden lines are preferred over center lines.

Select MORE INFO or NEXT to continue and press the Enter key.



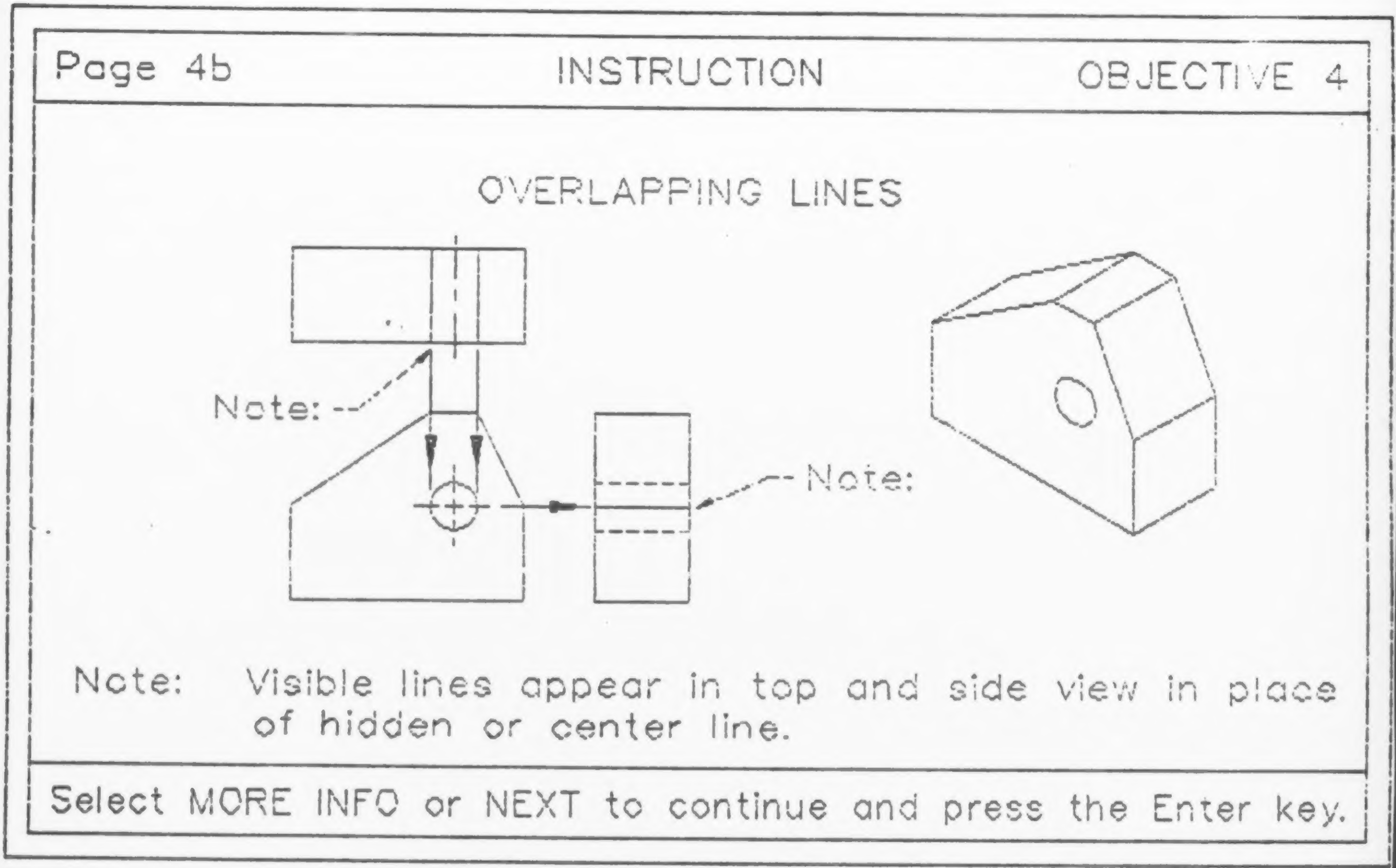
Page 4a INSTRUCTION OBJECTIVE 4

OVERLAPPING LINES

Note:
Note:
Note:
Note:

Note: Visible line appears in side view, not hidden line.

Select MORE INFO or NEXT to continue and press the Enter key.

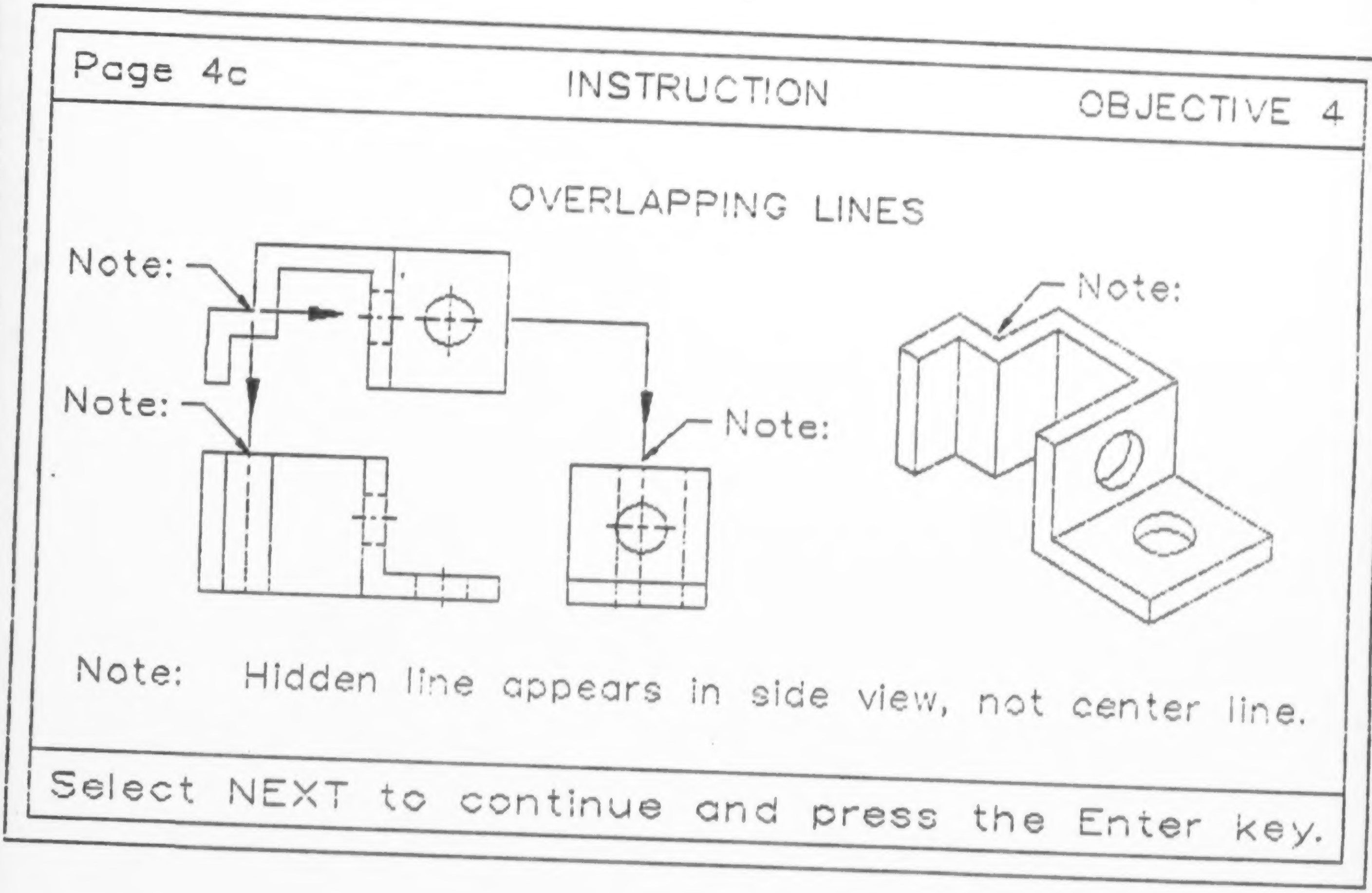


Page 4b INSTRUCTION OBJECTIVE 4

OVERLAPPING LINES

Note: Visible lines appear in top and side view in place of hidden or center line.

Select MORE INFO or NEXT to continue and press the Enter key.


Note:
Note:
Note:
Note:

Page 4c

INSTRUCTION

OBJECTIVE 4

OVERLAPPING LINES

Note: Hidden line appears in side view, not center line.

Select NEXT to continue and press the Enter key.

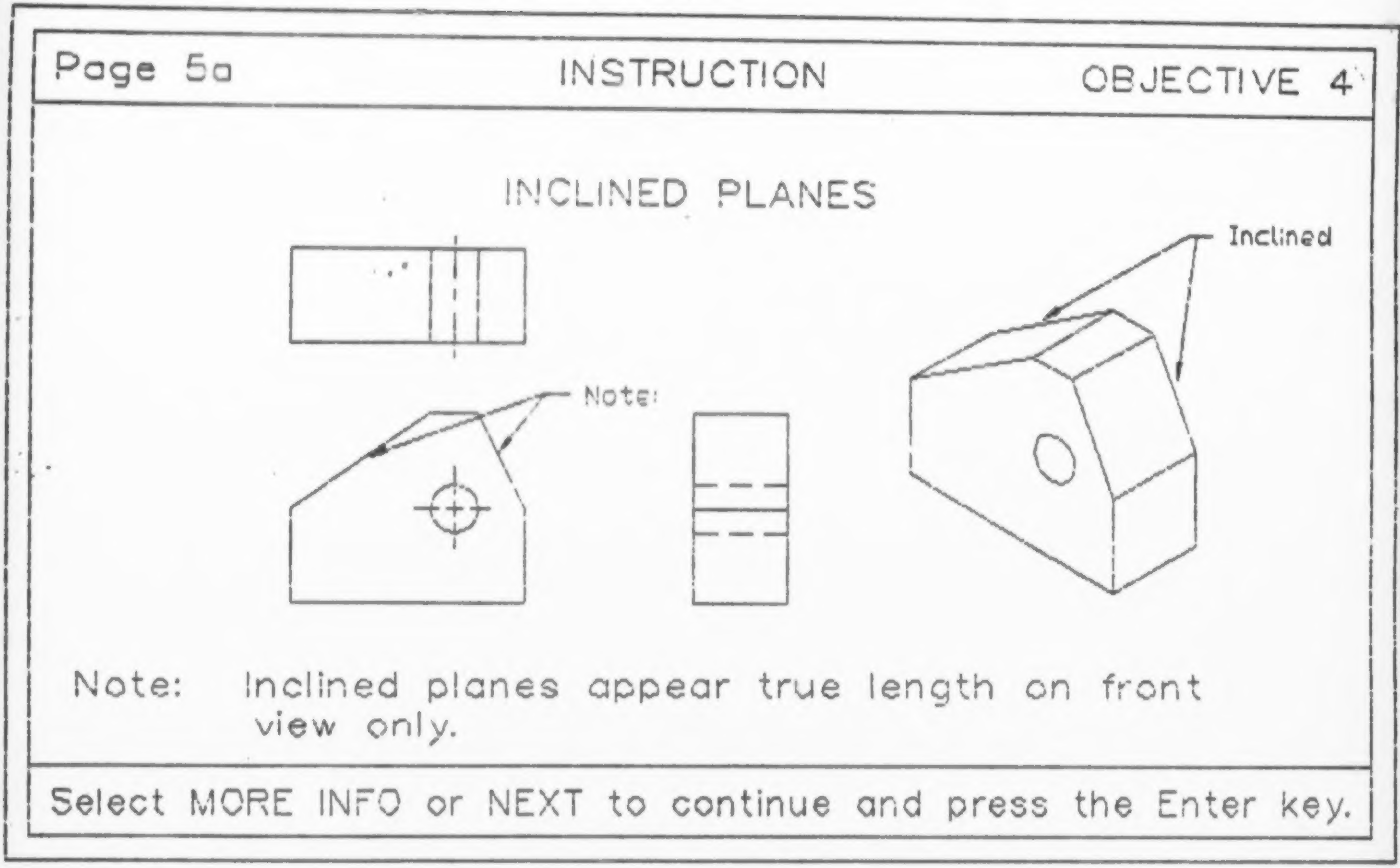
2. Inclined Planes

Surfaces that are not located at a right angle or parallel to other planes are called INCLINED. Inclined planes do not appear to be true size on all projection views.

The view that reveals the inclined plane will normally show the correct dimension.

Remember that an inclined plane may appear foreshortened on adjacent views.

Select MORE INFO or NEXT to continue and press the Enter key.



Page 5a INSTRUCTION OBJECTIVE 4

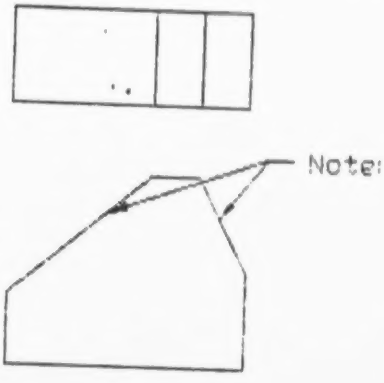
INCLINED PLANES

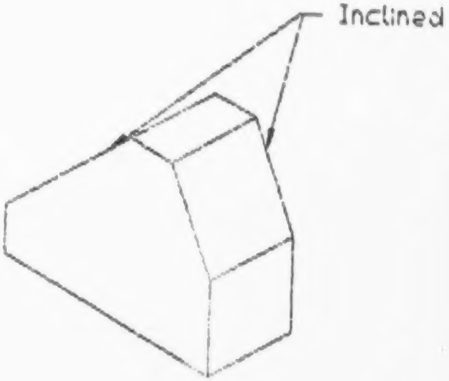
Note: Inclined planes appear true length on front view only.

Select MORE INFO or NEXT to continue and press the Enter key.

Page 5b INSTRUCTION OBJECTIVE 4

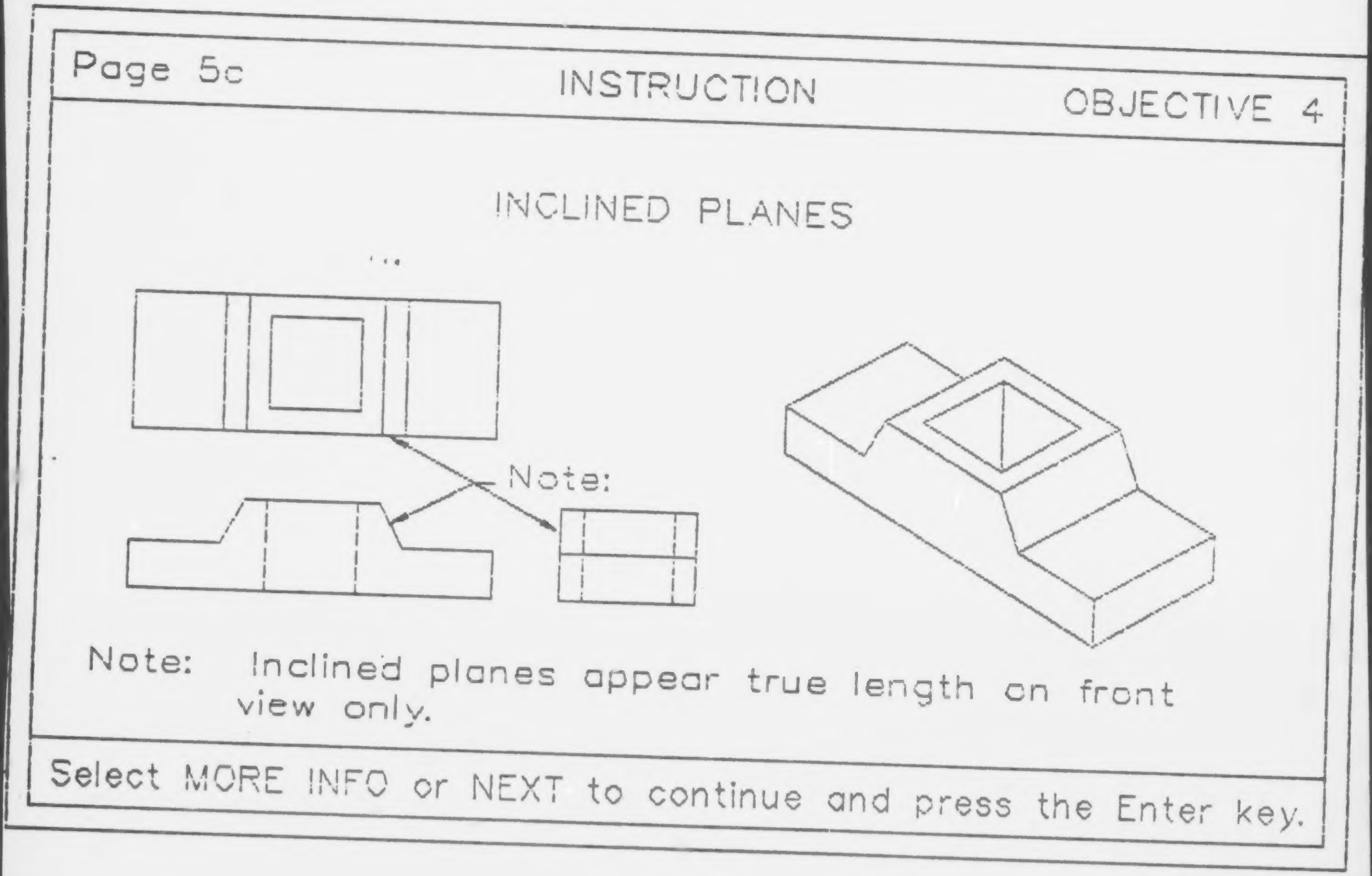
INCLINED PLANES





Note: Inclined planes appear true length on front view only.

Select MORE INFO or NEXT to continue and press the Enter key.

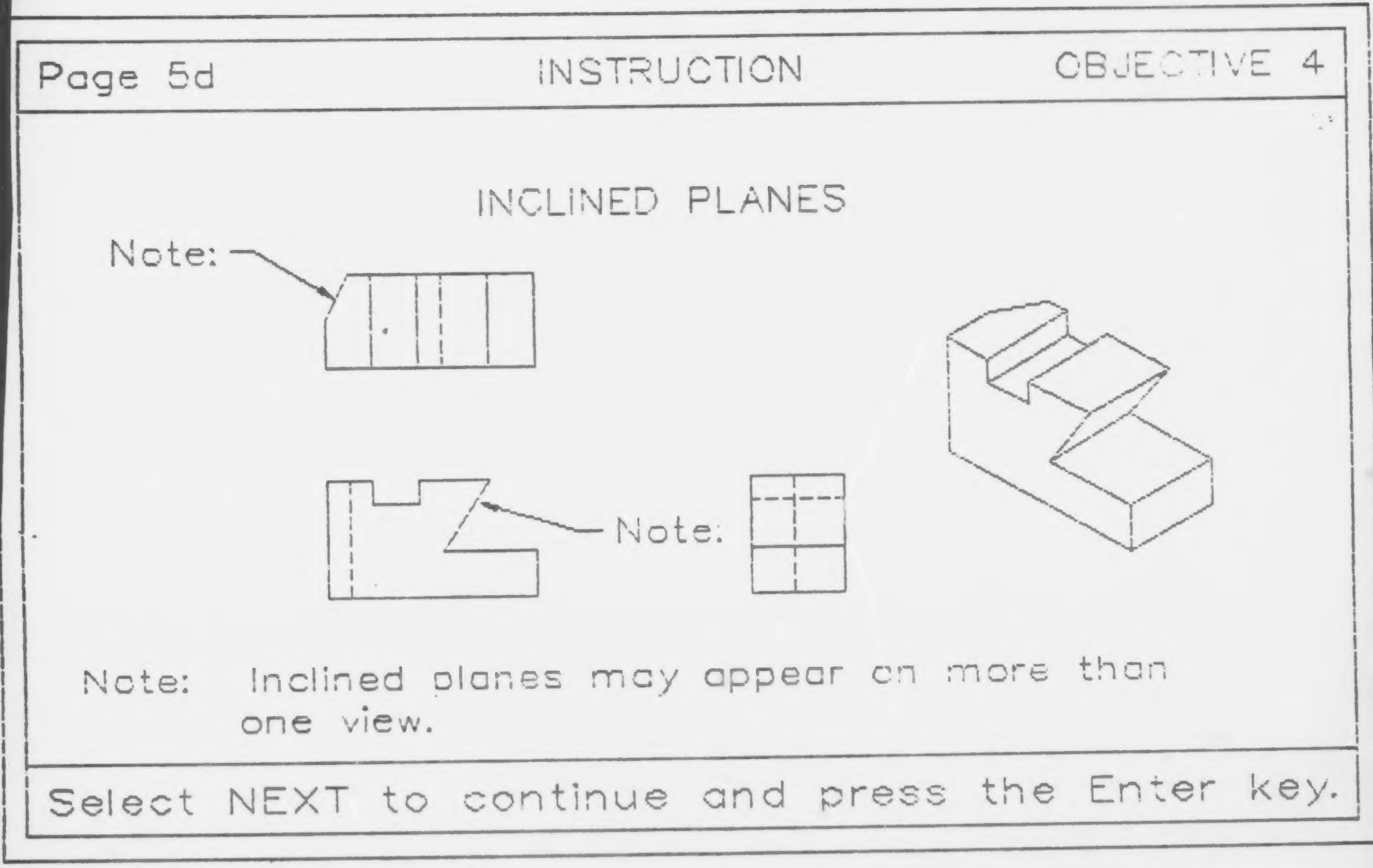


Page 5c INSTRUCTION OBJECTIVE 4

INCLINED PLANES

Note: Inclined planes appear true length on front view only.

Select MORE INFO or NEXT to continue and press the Enter key.

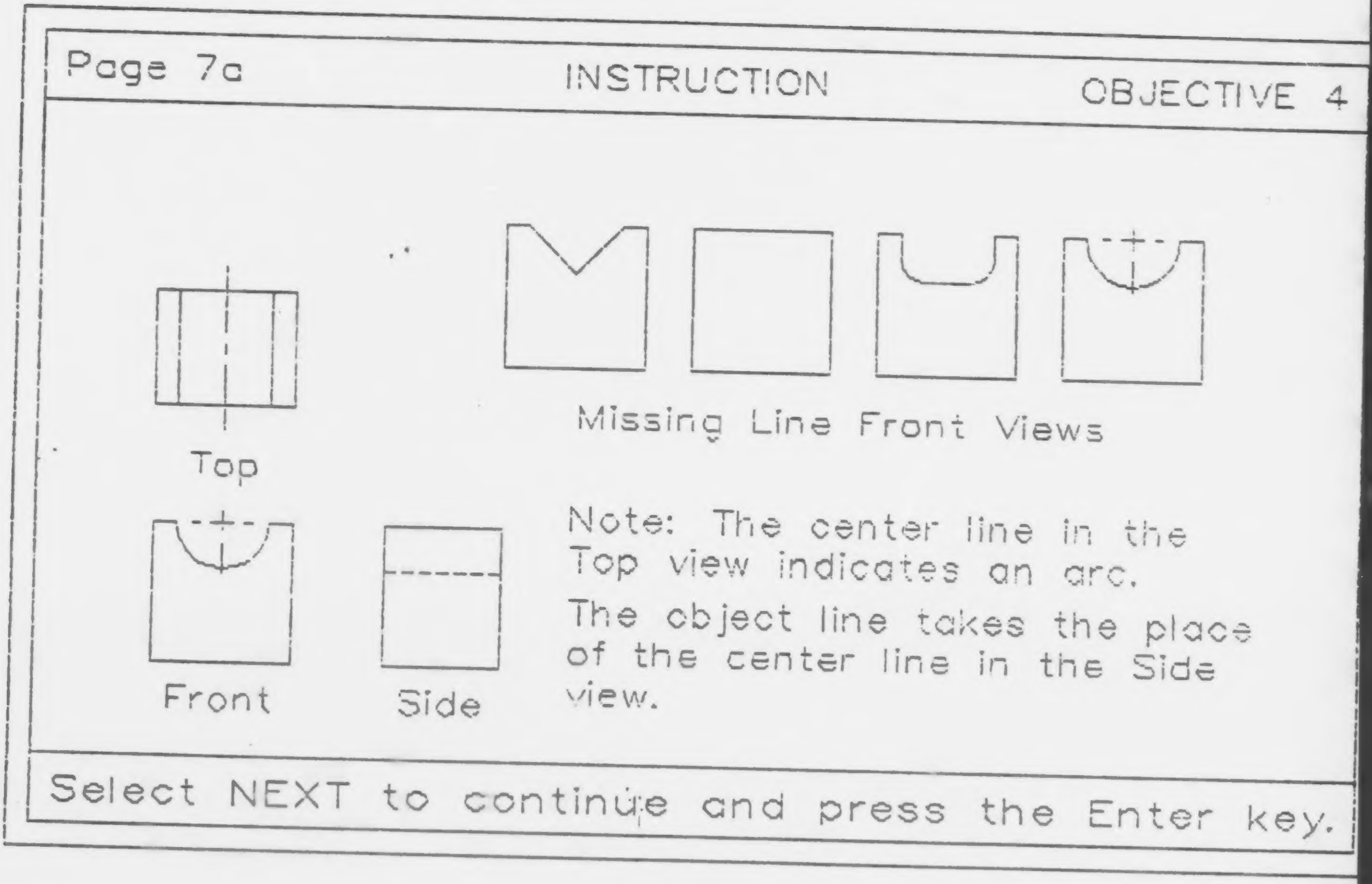


Page 5d INSTRUCTION OBJECTIVE 4

INCLINED PLANES

Note: Inclined planes may appear on more than one view.

Select NEXT to continue and press the Enter key.

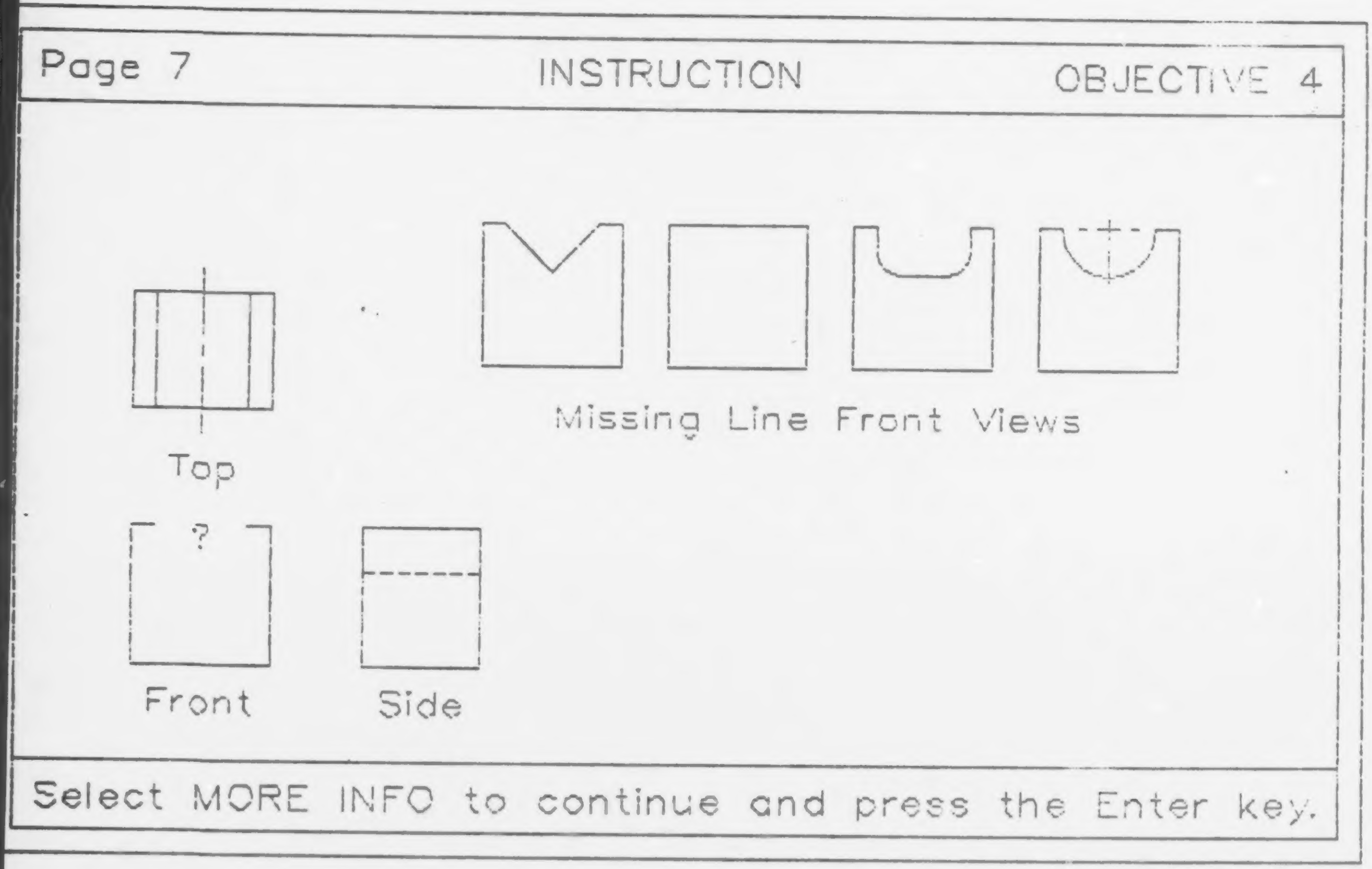

Top
Missing Line Front Views
Front
Side

Page 7a INSTRUCTION OBJECTIVE 4

Note: The center line in the Top view indicates an arc.

The object line takes the place of the center line in the Side view.

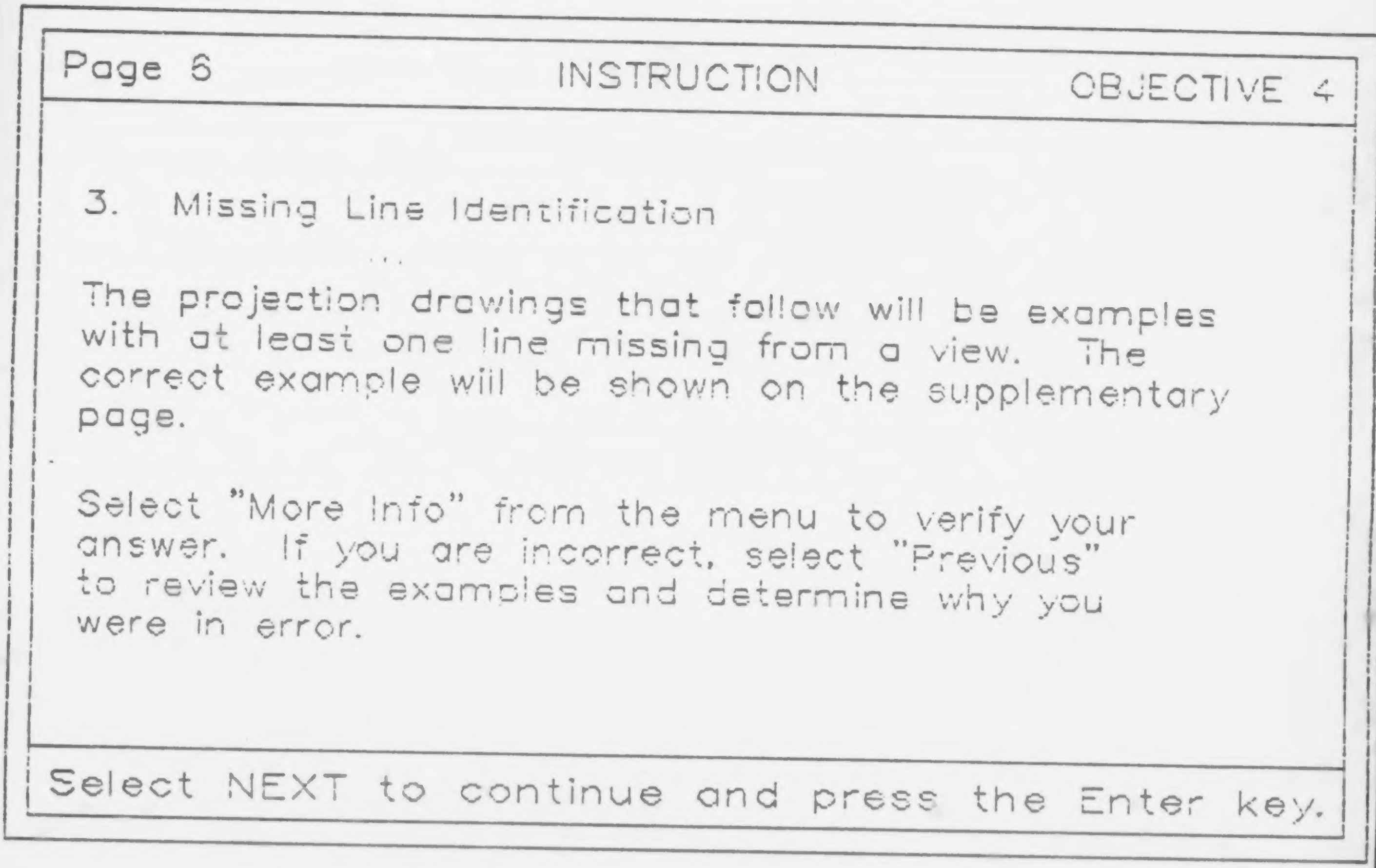
Select NEXT to continue and press the Enter key.



Page 7 INSTRUCTION OBJECTIVE 4

Top
?
Front
Side
Missing Line Front Views

Select MORE INFO to continue and press the Enter key.



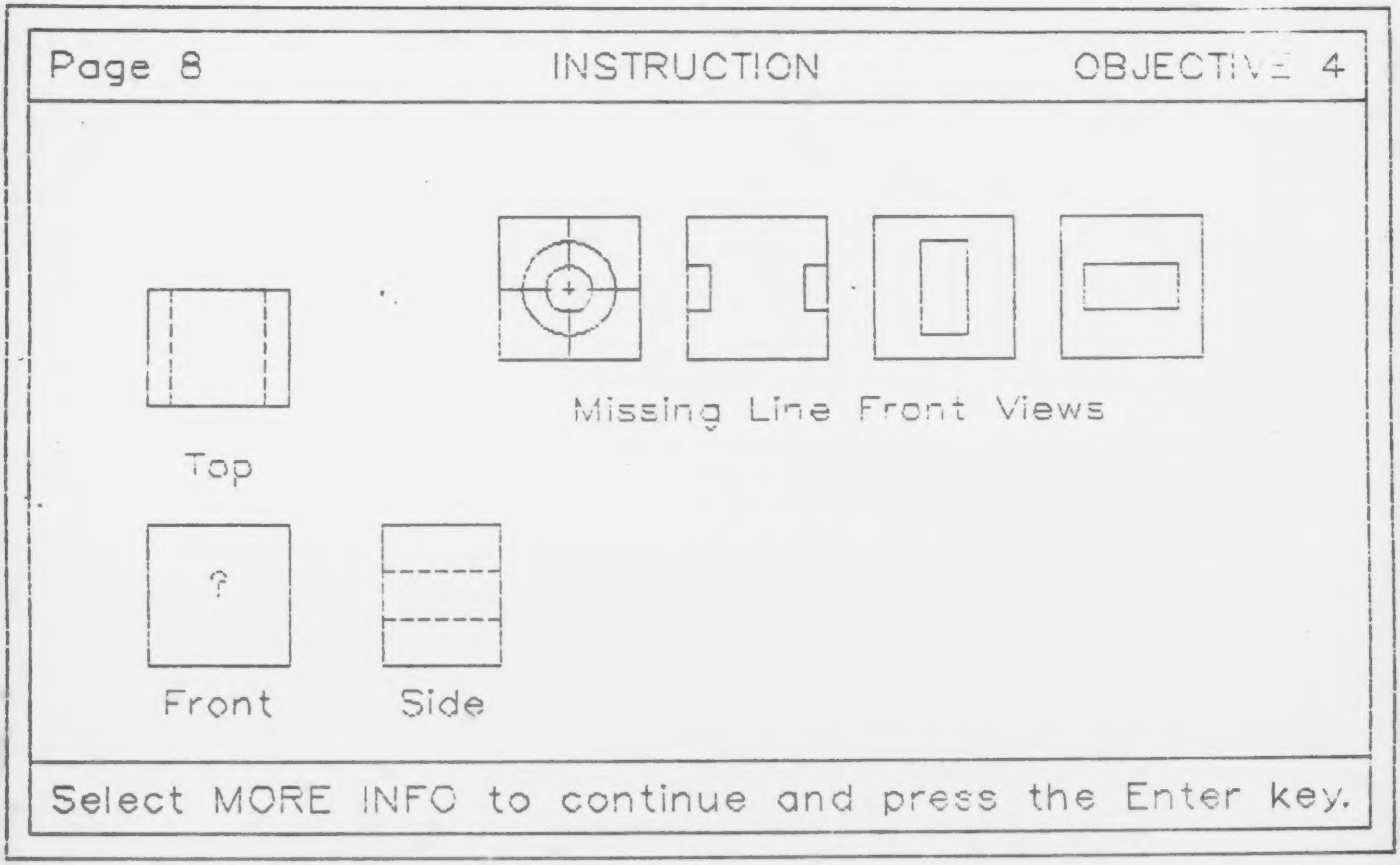
Page 6 INSTRUCTION OBJECTIVE 4

3. Missing Line Identification

The projection drawings that follow will be examples with at least one line missing from a view. The correct example will be shown on the supplementary page.

Select "More Info" from the menu to verify your answer. If you are incorrect, select "Previous" to review the examples and determine why you were in error.

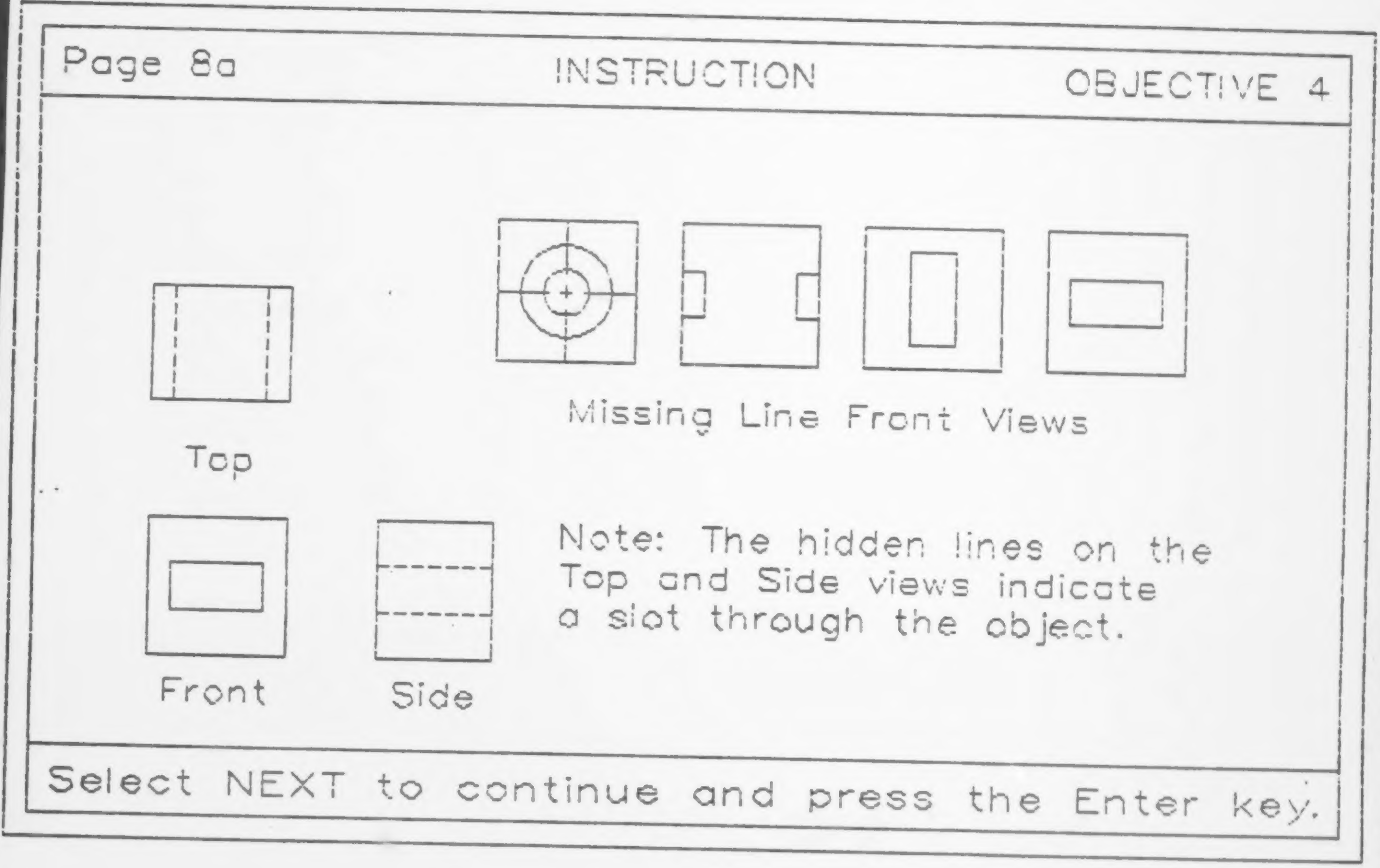
Select NEXT to continue and press the Enter key.



Page 8 INSTRUCTION OBJECTIVE 4

Missing Line Front Views
Top
?
Front
Side

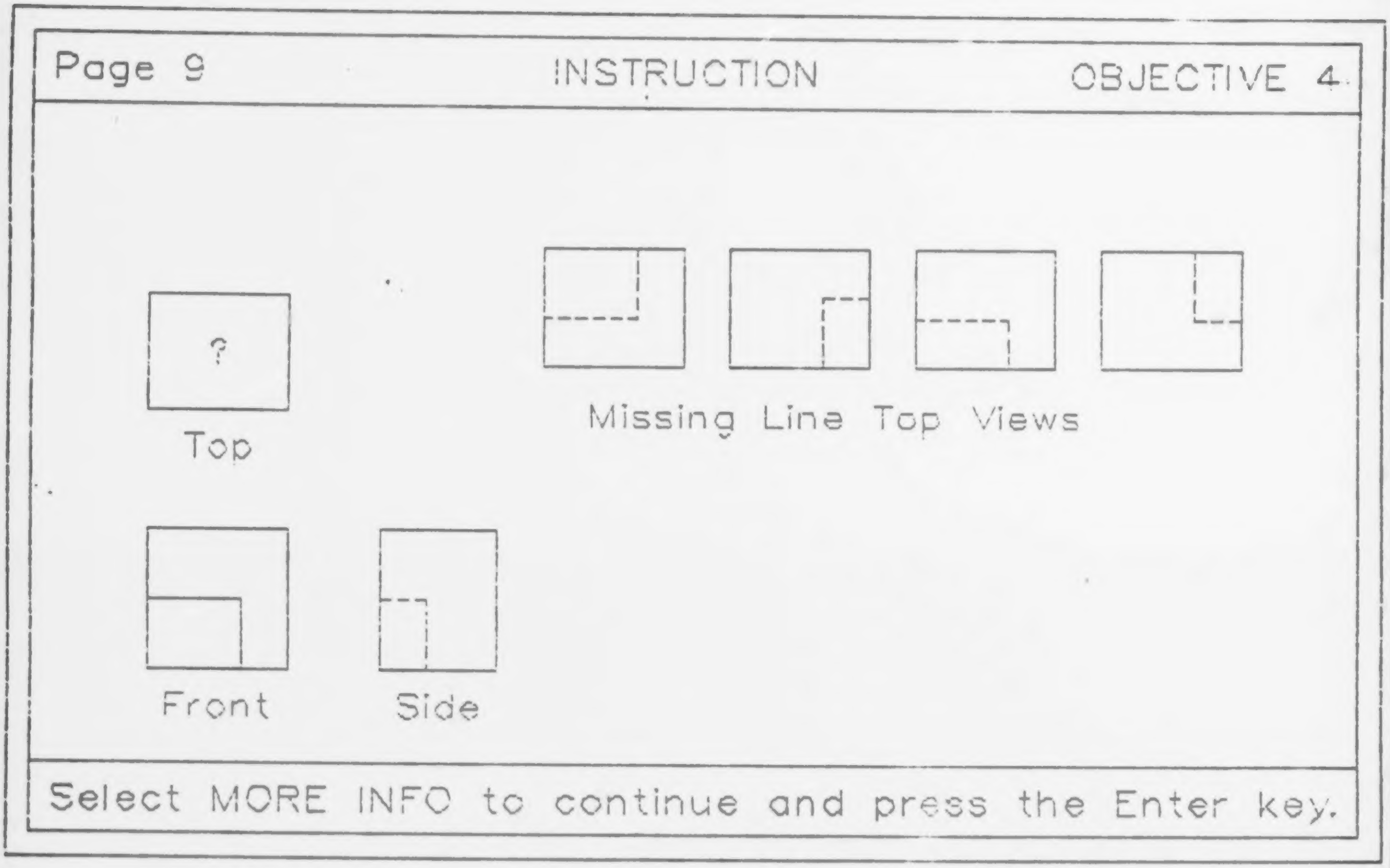
Select MORE INFO to continue and press the Enter key.


Top
Missing Line Front Views
Front
Side

Page 8a INSTRUCTION OBJECTIVE 4

Note: The hidden lines on the Top and Side views indicate a slot through the object.

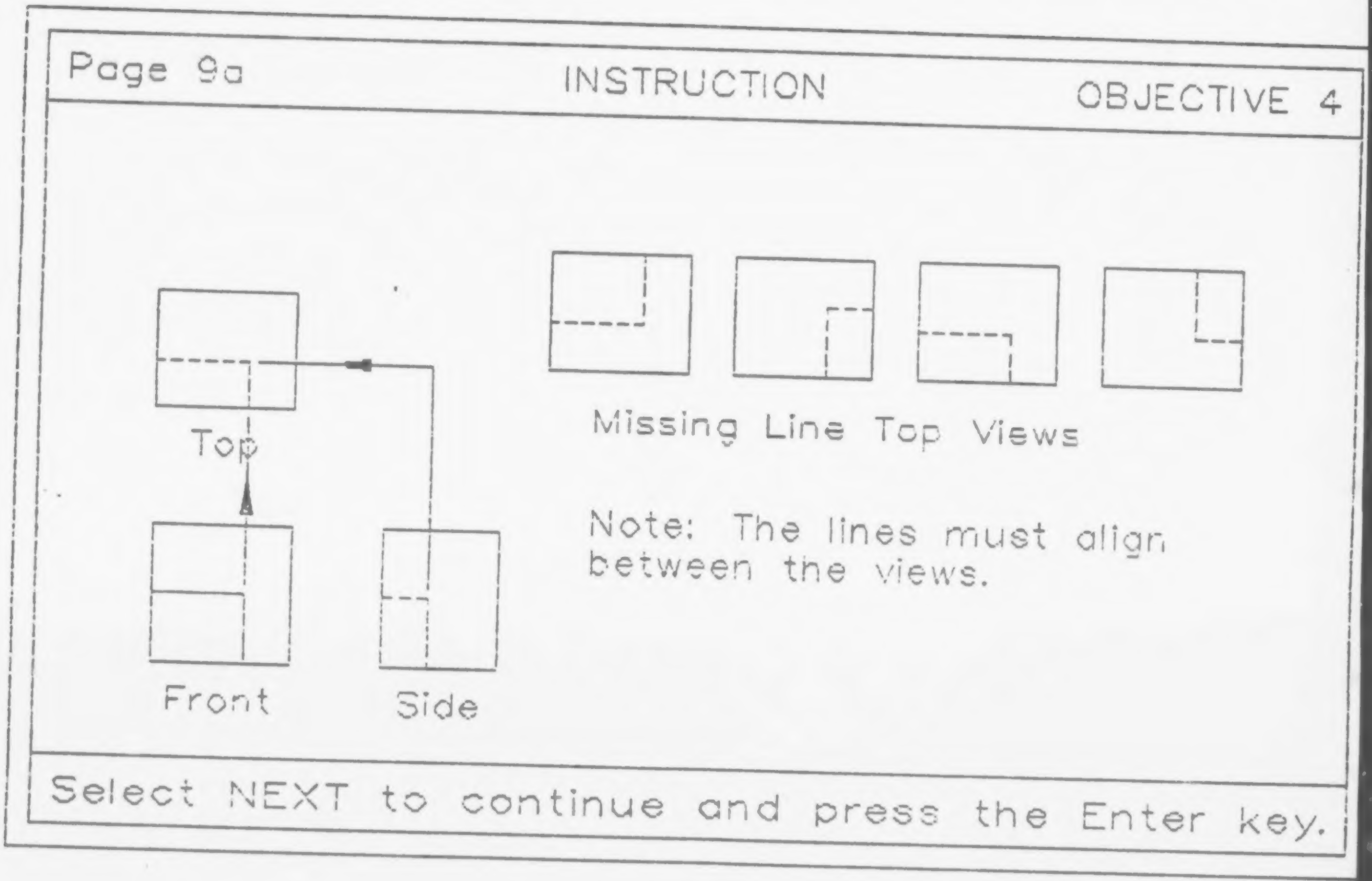
Select NEXT to continue and press the Enter key.



Page 9 INSTRUCTION OBJECTIVE 4

?
Top
Missing Line Top Views
Front
Side

Select MORE INFO to continue and press the Enter key.

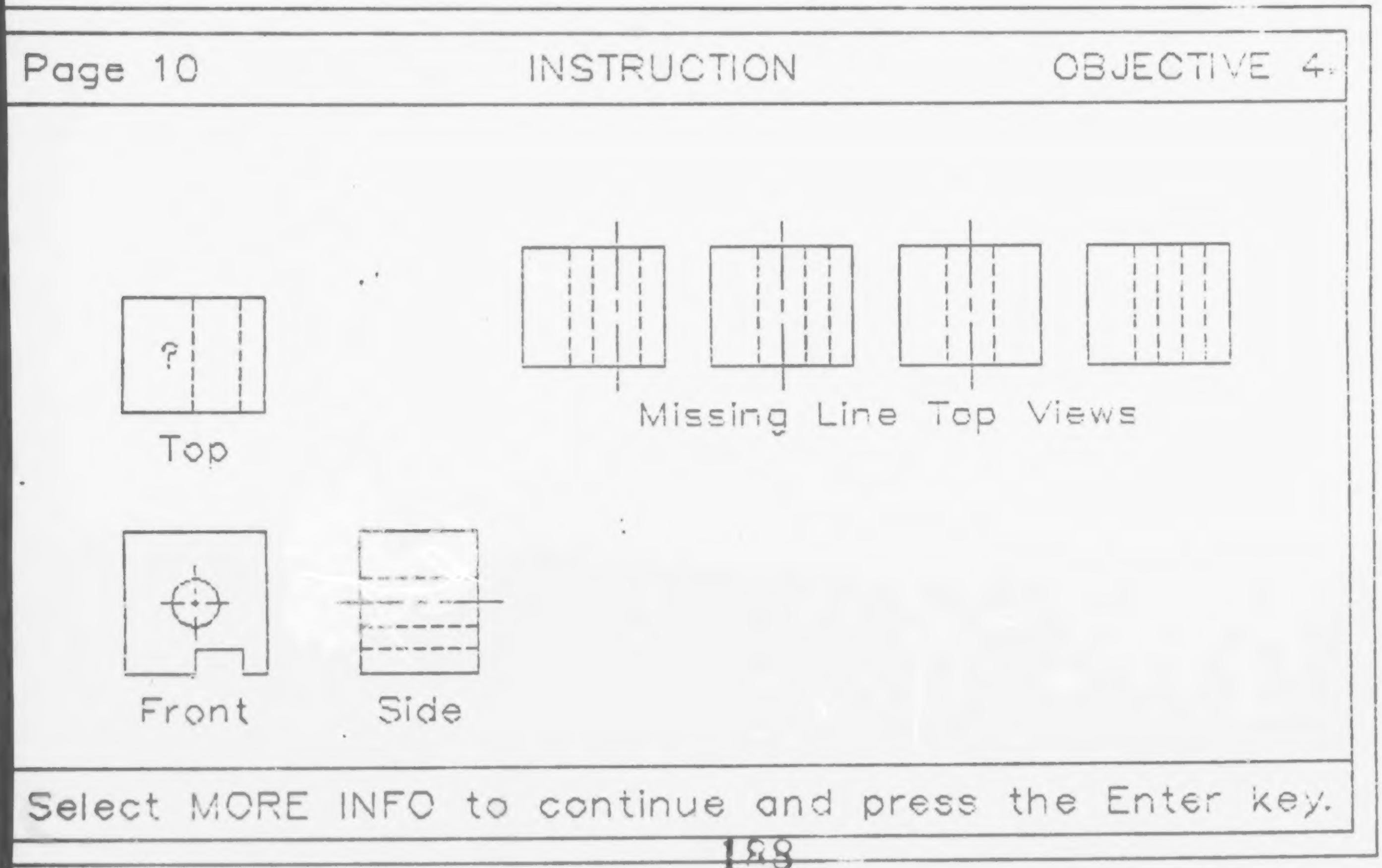


Page 9a INSTRUCTION OBJECTIVE 4

Missing Line Top Views

Note: The lines must align between the views.

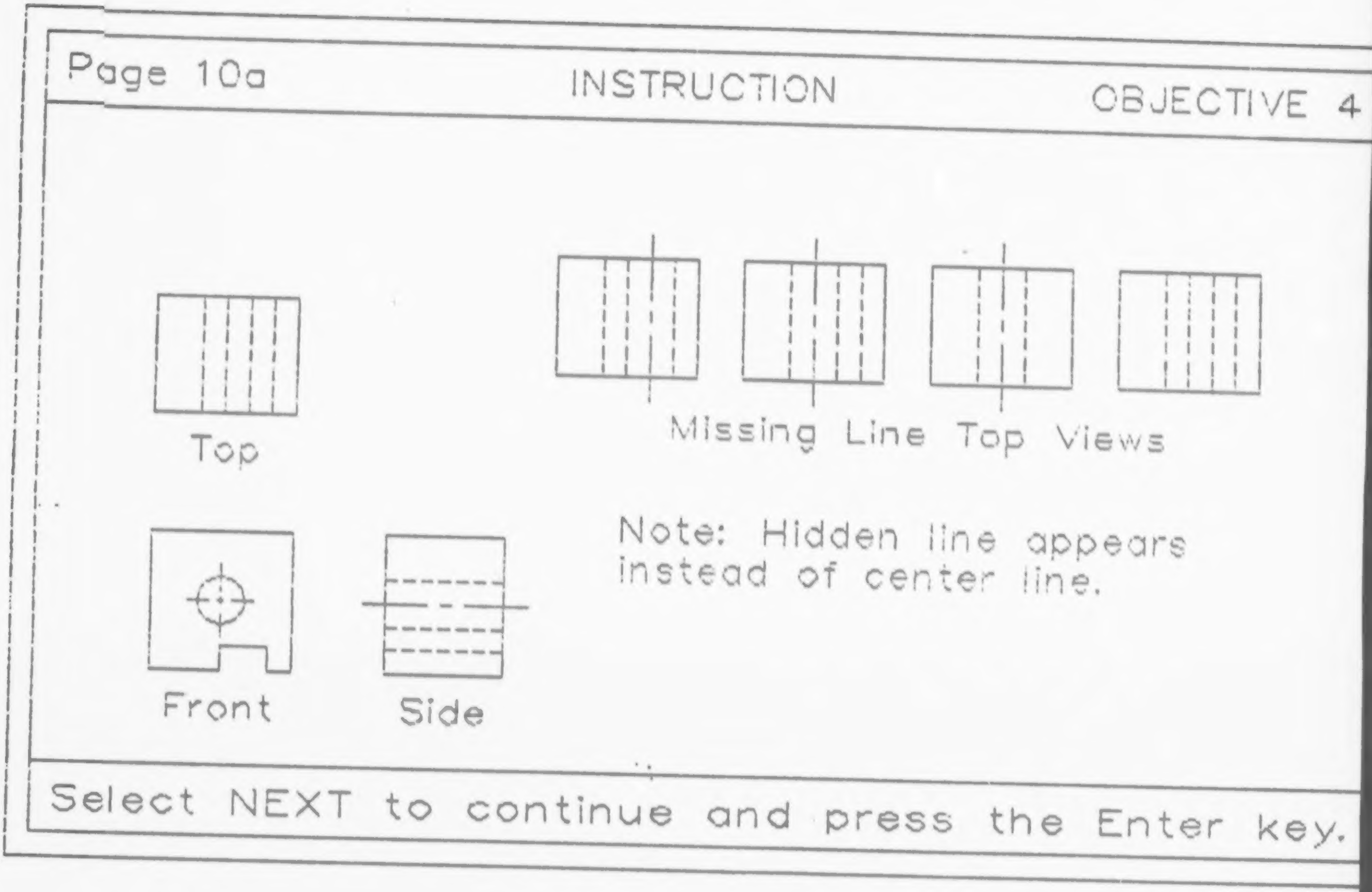
Select NEXT to continue and press the Enter key.



Page 10 INSTRUCTION OBJECTIVE 4

?
Top
Missing Line Top Views
Front
Side

Select MORE INFO to continue and press the Enter key.

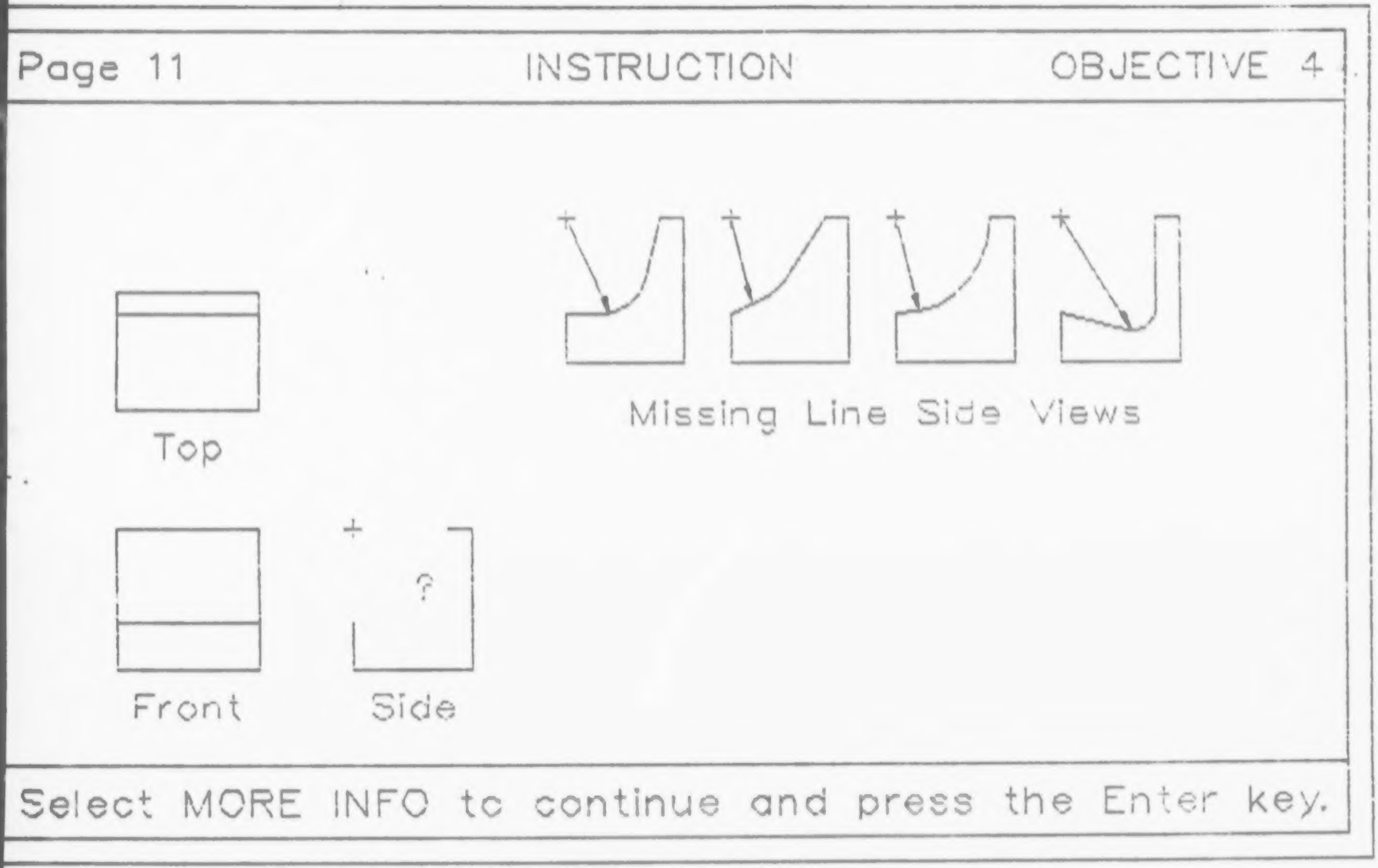


Page 10a INSTRUCTION OBJECTIVE 4

Top
Missing Line Top Views
Front
Side

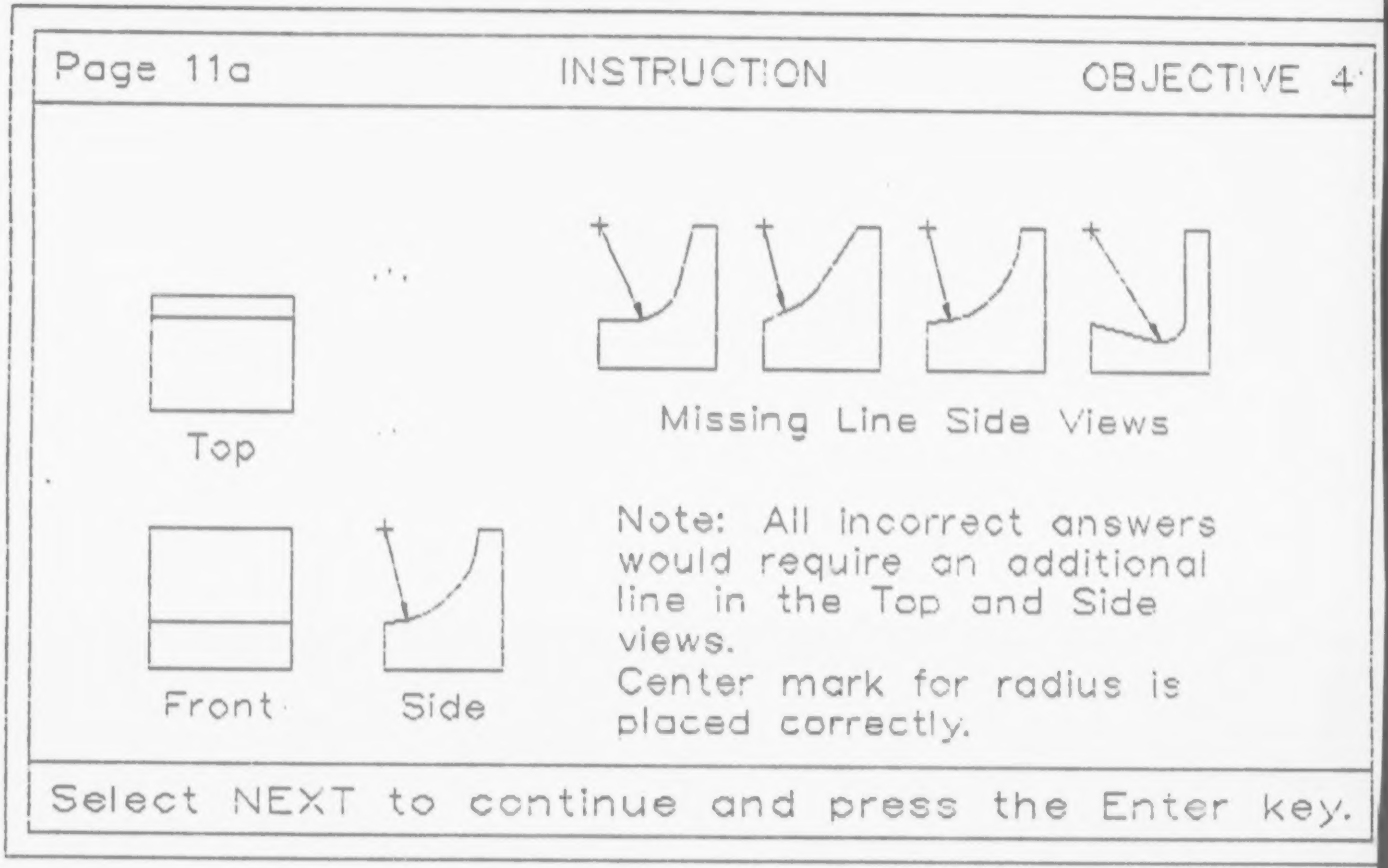
Note: Hidden line appears instead of center line.

Select NEXT to continue and press the Enter key.


Top
Missing Line Side Views
Front
?
Side

Page 11 INSTRUCTION OBJECTIVE 4

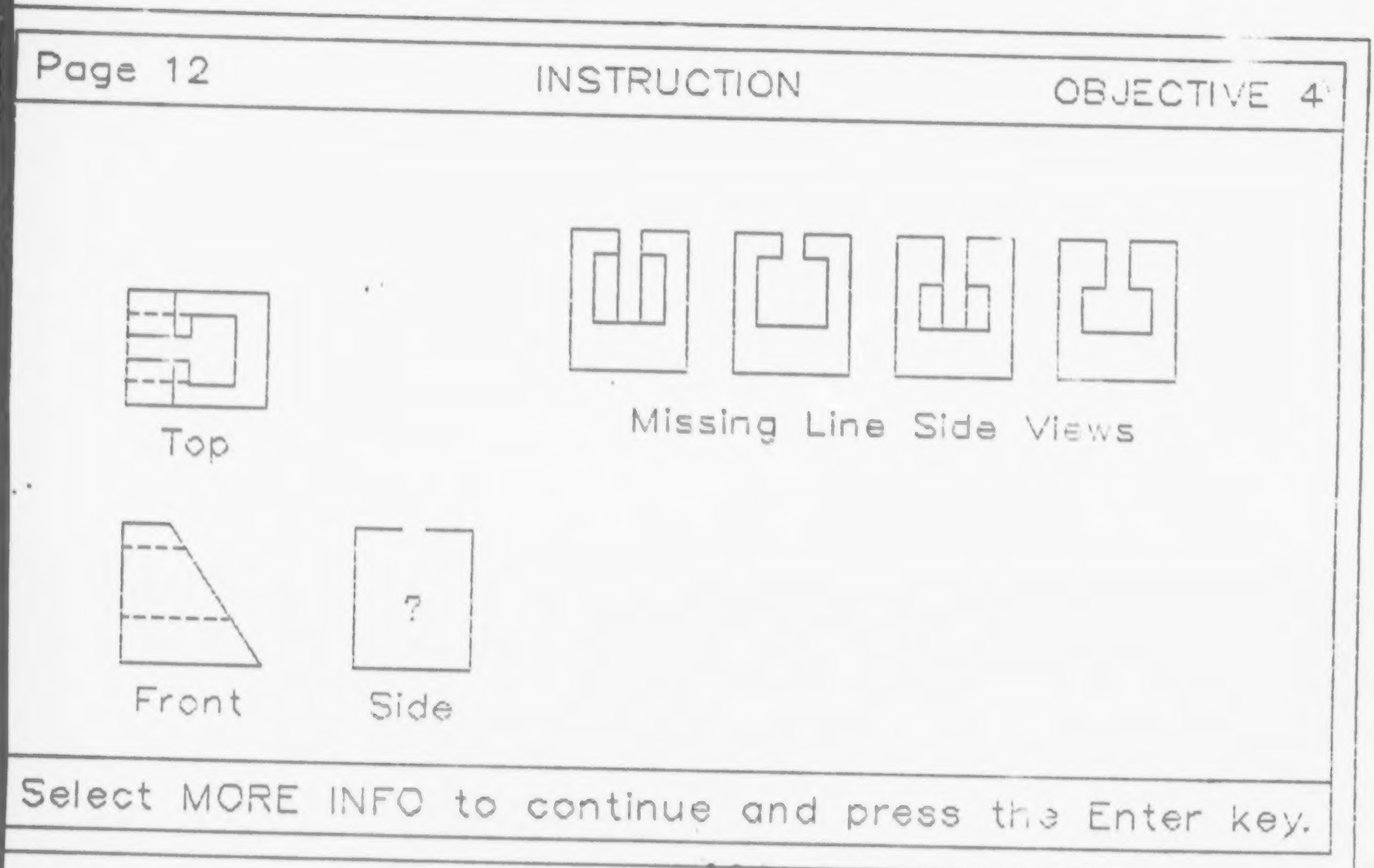
Select MORE INFO to continue and press the Enter key.


Top
Missing Line Side Views
Front
Side

Page 11a INSTRUCTION OBJECTIVE 4

Note: All incorrect answers would require an additional line in the Top and Side views.
Center mark for radius is placed correctly.

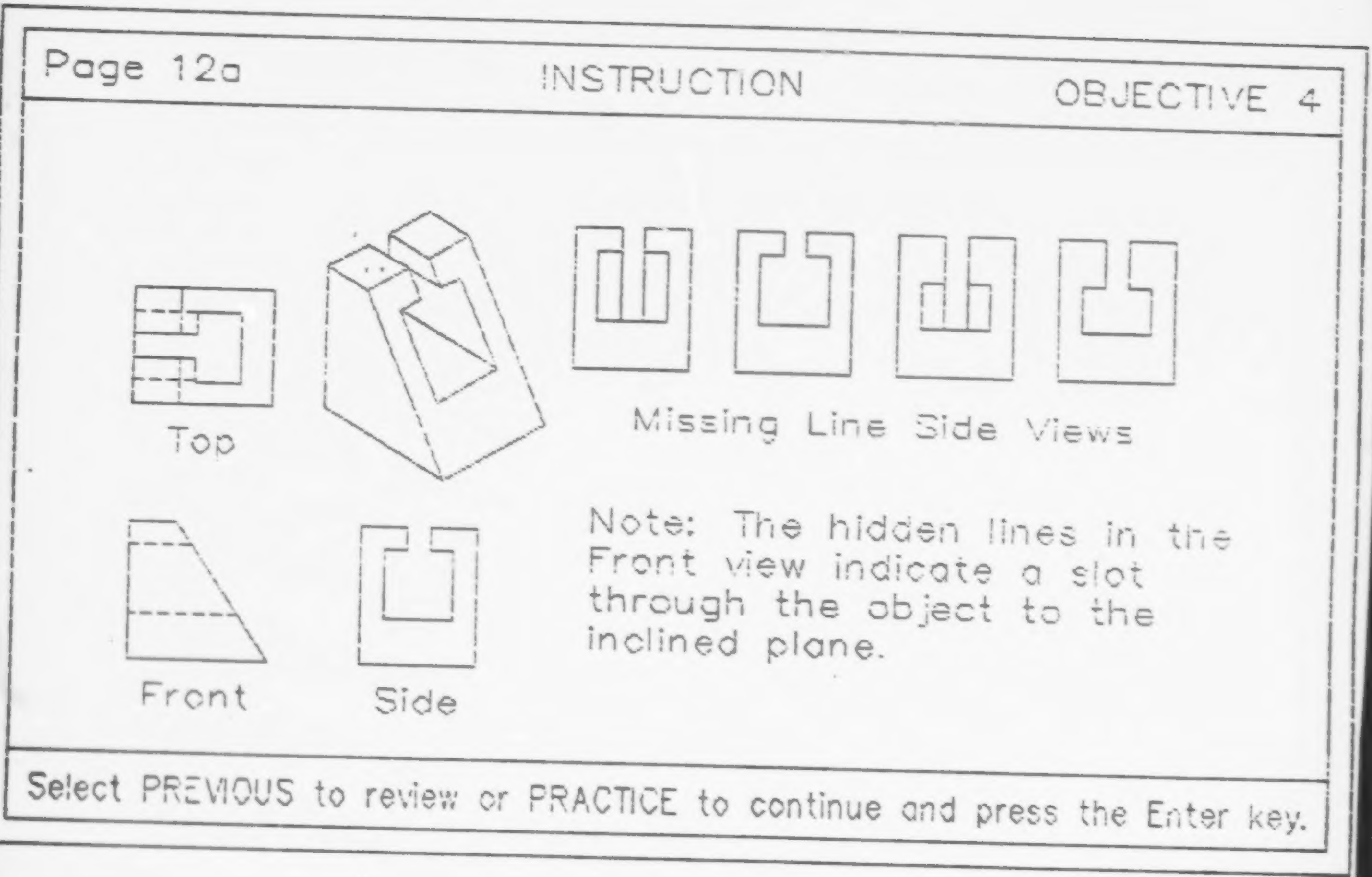
Select NEXT to continue and press the Enter key.



Page 12 INSTRUCTION OBJECTIVE 4

Top
Missing Line Side Views
Front
?
Side

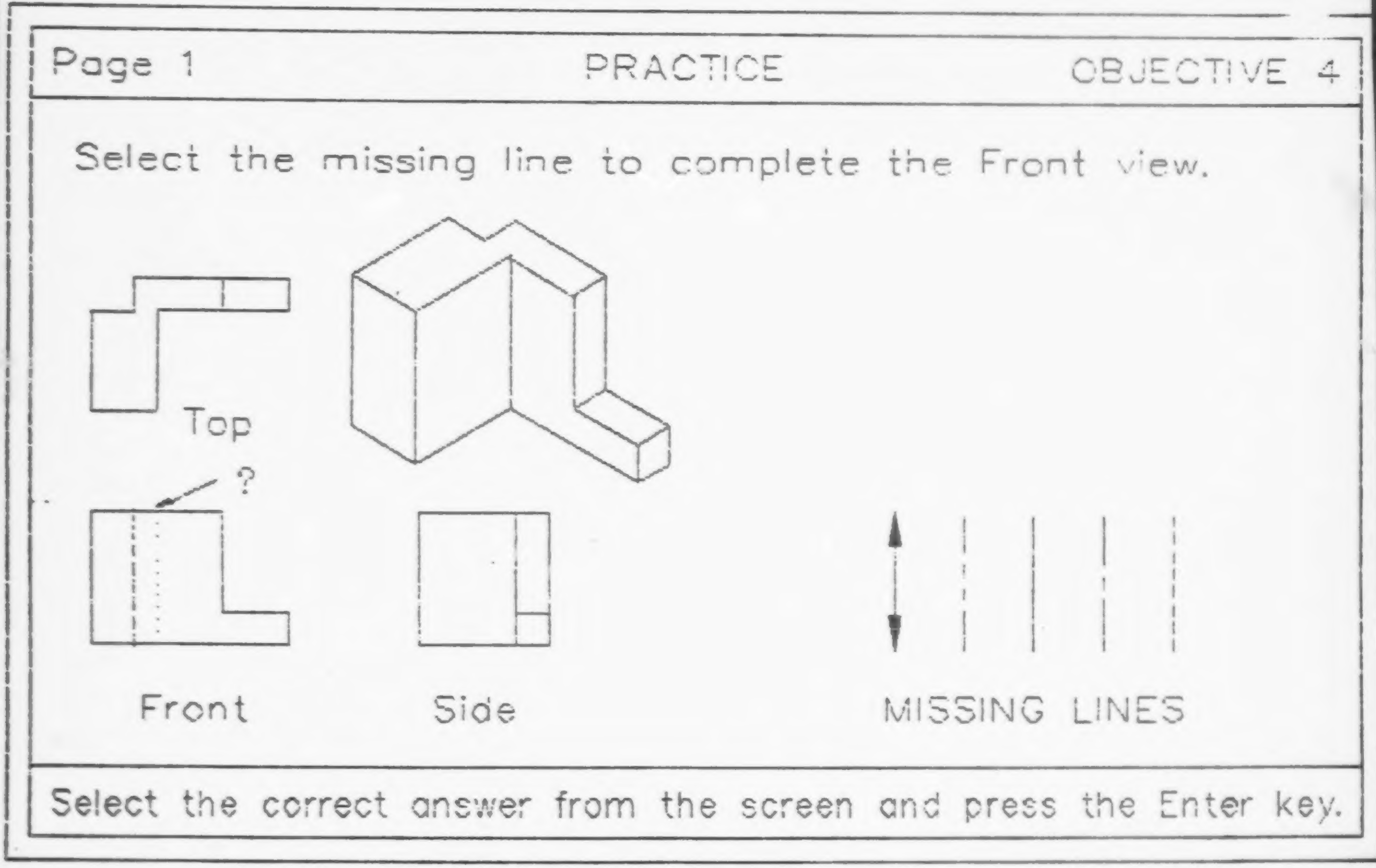
Select MORE INFO to continue and press the Enter key.


Top
Missing Line Side Views
Front
Side

Page 12a INSTRUCTION OBJECTIVE 4

Note: The hidden lines in the Front view indicate a slot through the object to the inclined plane.

Select PREVIOUS to review or PRACTICE to continue and press the Enter key.

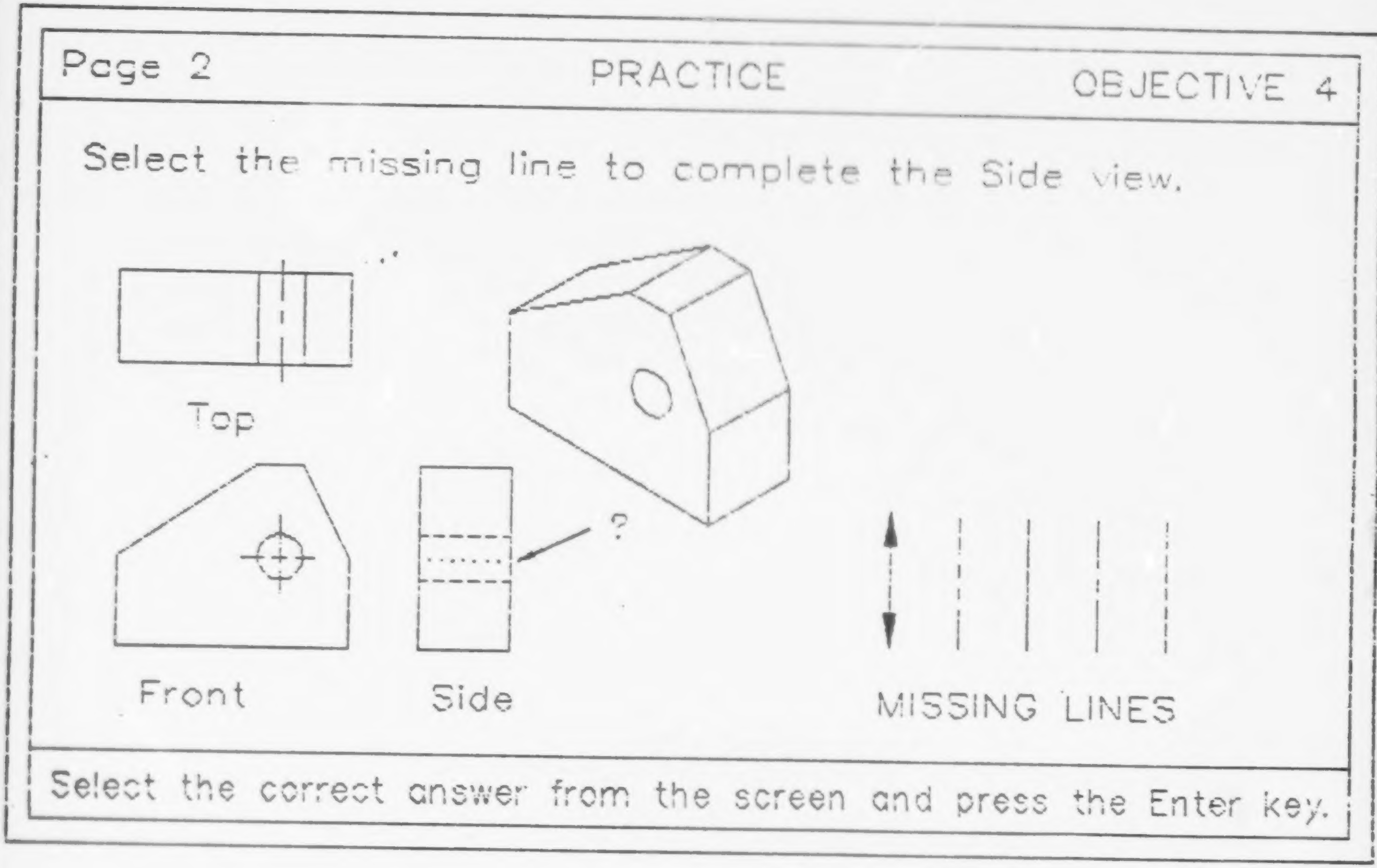


Page 1 PRACTICE OBJECTIVE 4

Select the missing line to complete the Front view.

Top
?
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

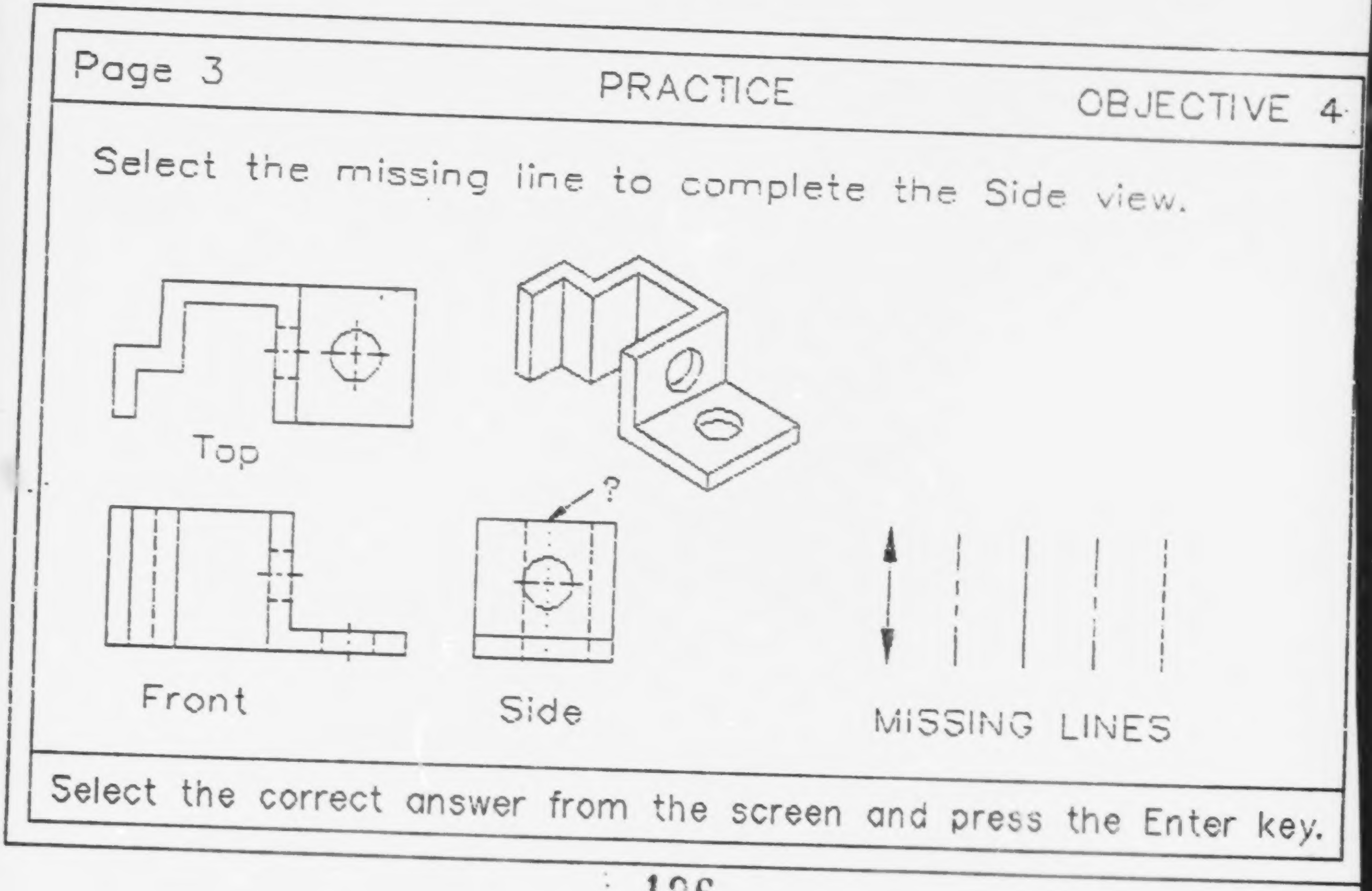


Page 2 PRACTICE OBJECTIVE 4

Select the missing line to complete the Side view.

Top
?
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

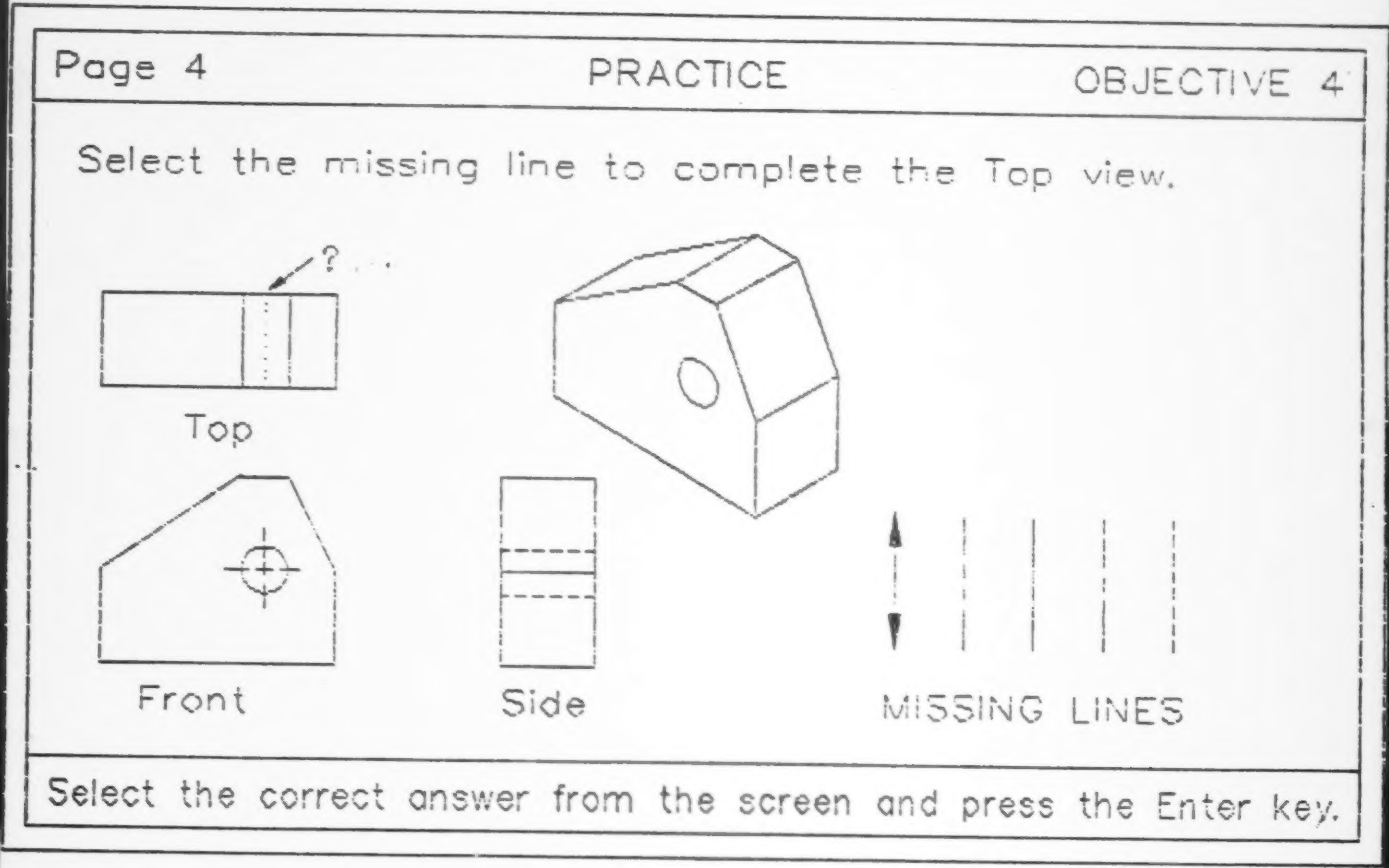


Page 3 PRACTICE OBJECTIVE 4

Select the missing line to complete the Side view.

Top
?
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

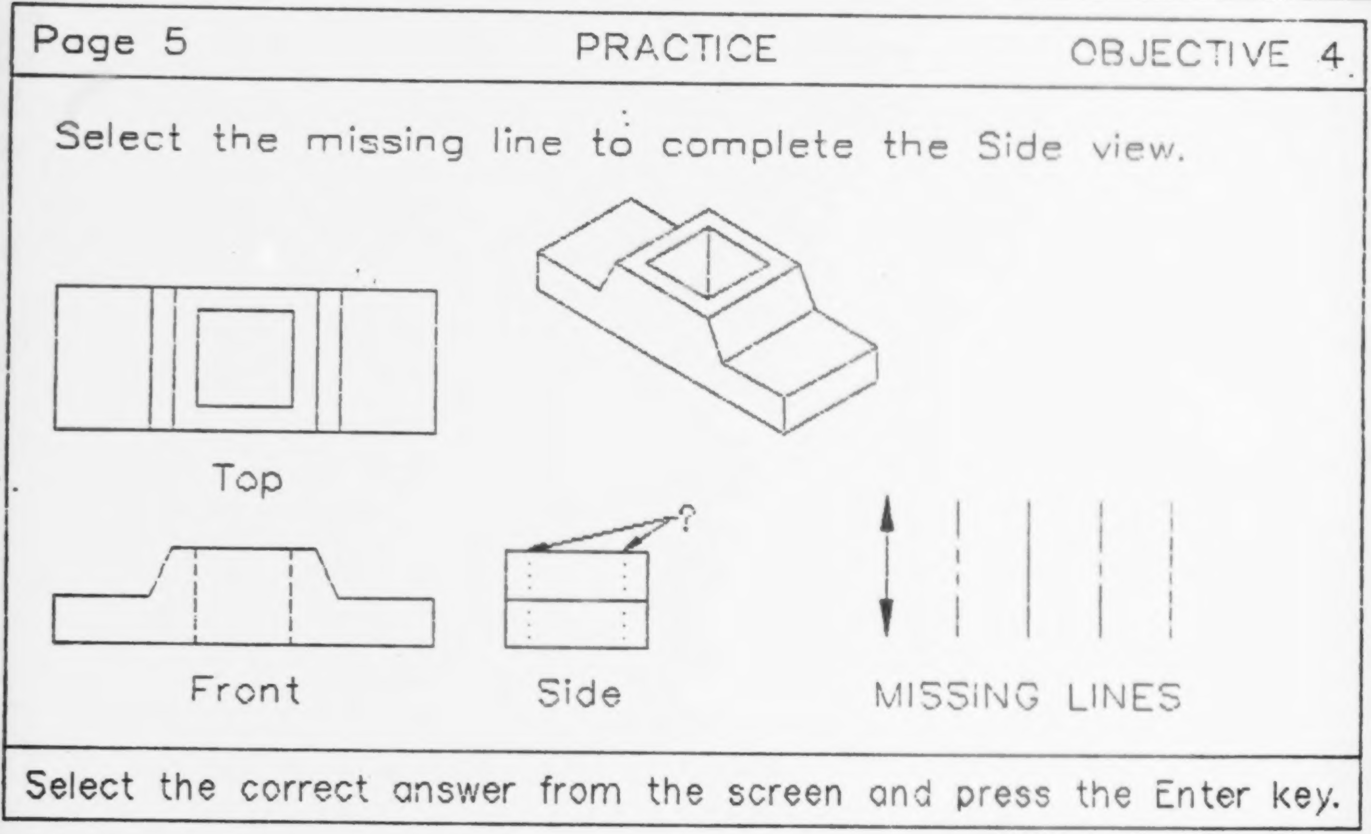


Page 4 PRACTICE OBJECTIVE 4

Select the missing line to complete the Top view.

?
Top
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

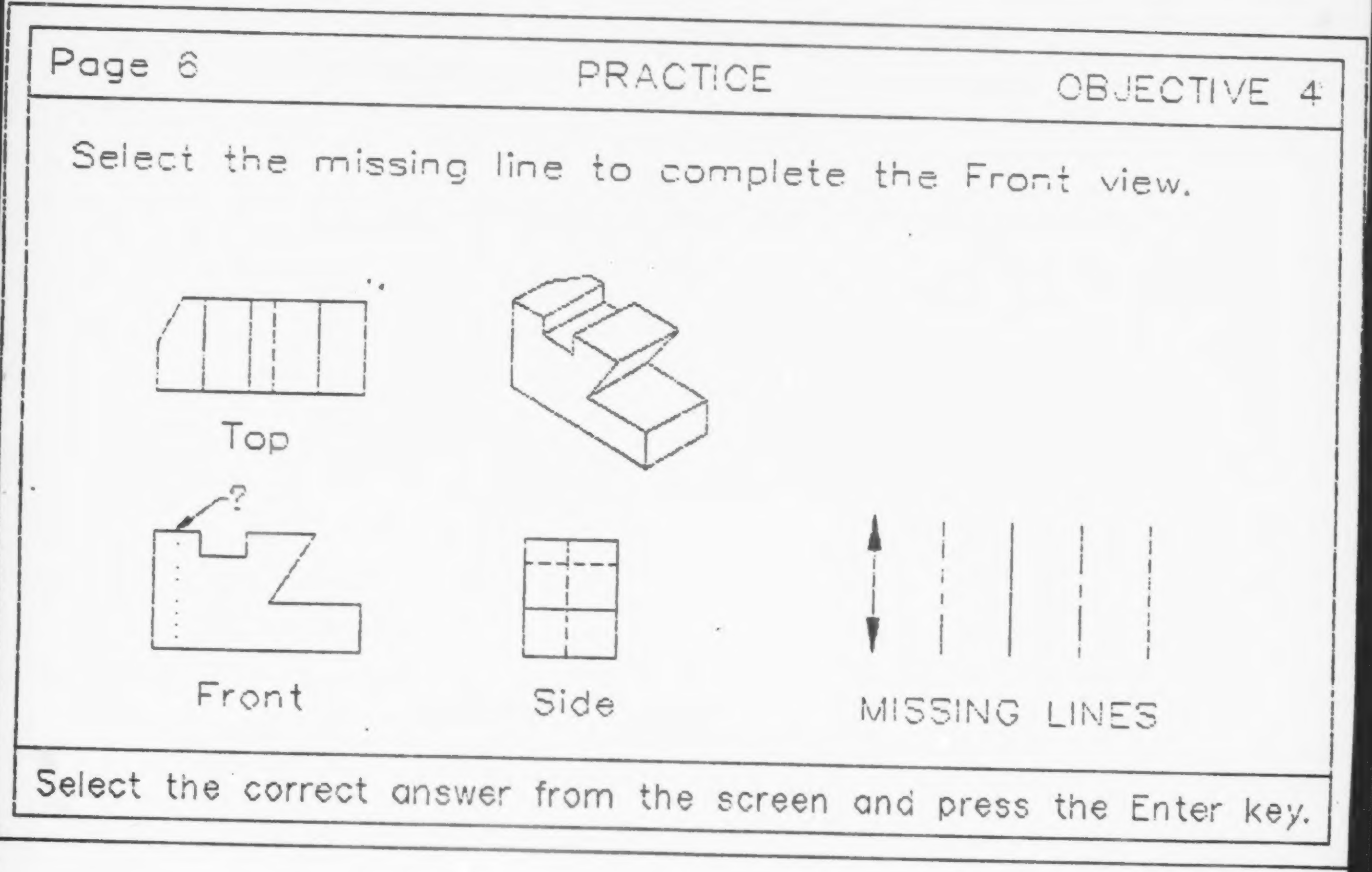


Page 5 PRACTICE OBJECTIVE 4

Select the missing line to complete the Side view.

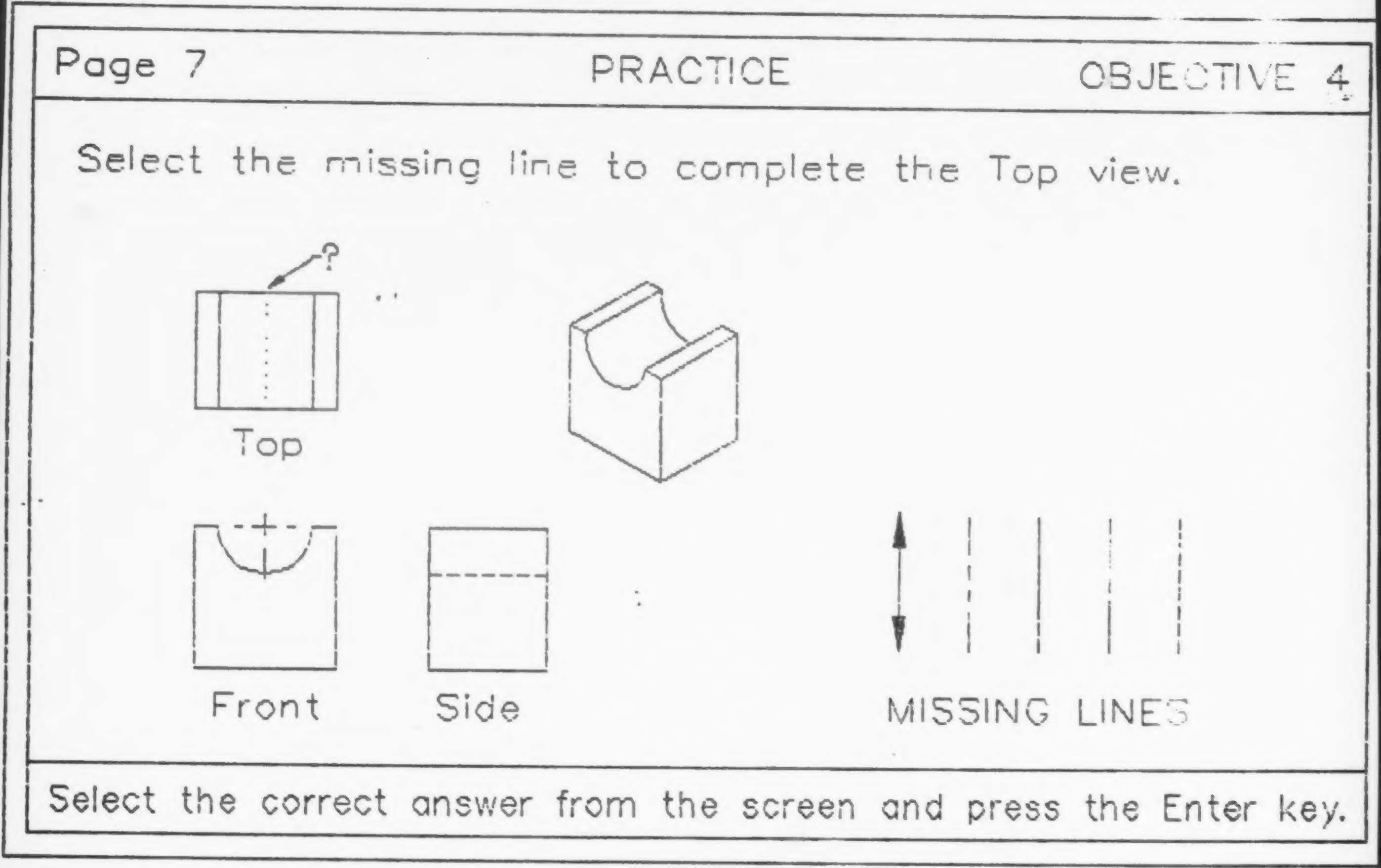
Top
Front
Side
?
MISSING LINES

Select the correct answer from the screen and press the Enter key.


Page 6
PRACTICE
OBJECTIVE 4
?
Top
Front
Side
MISSING LINES

Select the missing line to complete the Front view.

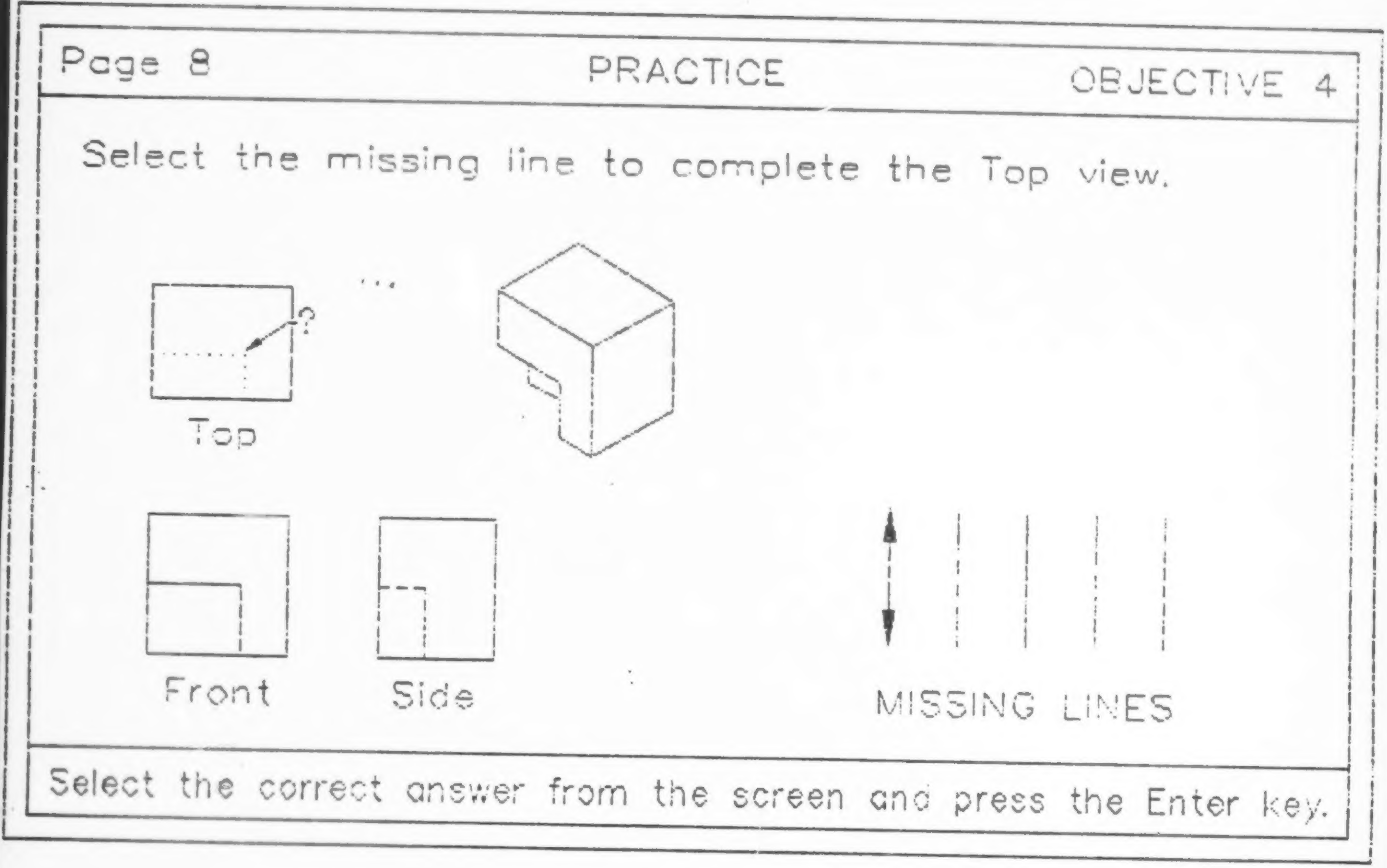
Select the correct answer from the screen and press the Enter key.


?
Top
Front
Side
MISSING LINES

Page 7 PRACTICE OBJECTIVE 4

Select the missing line to complete the Top view.

Select the correct answer from the screen and press the Enter key.

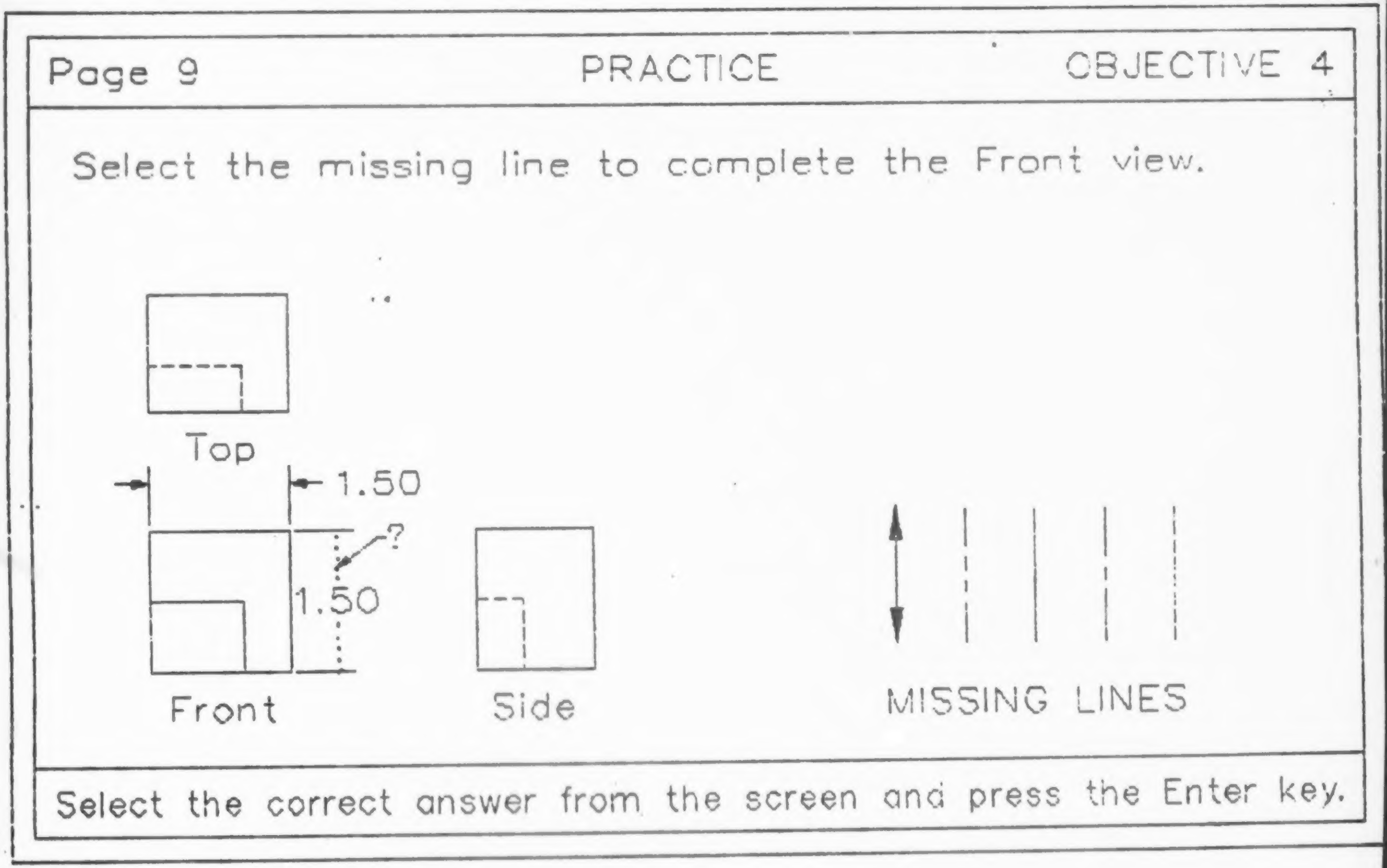


Page 8 PRACTICE OBJECTIVE 4

Select the missing line to complete the Top view.

?
Top
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

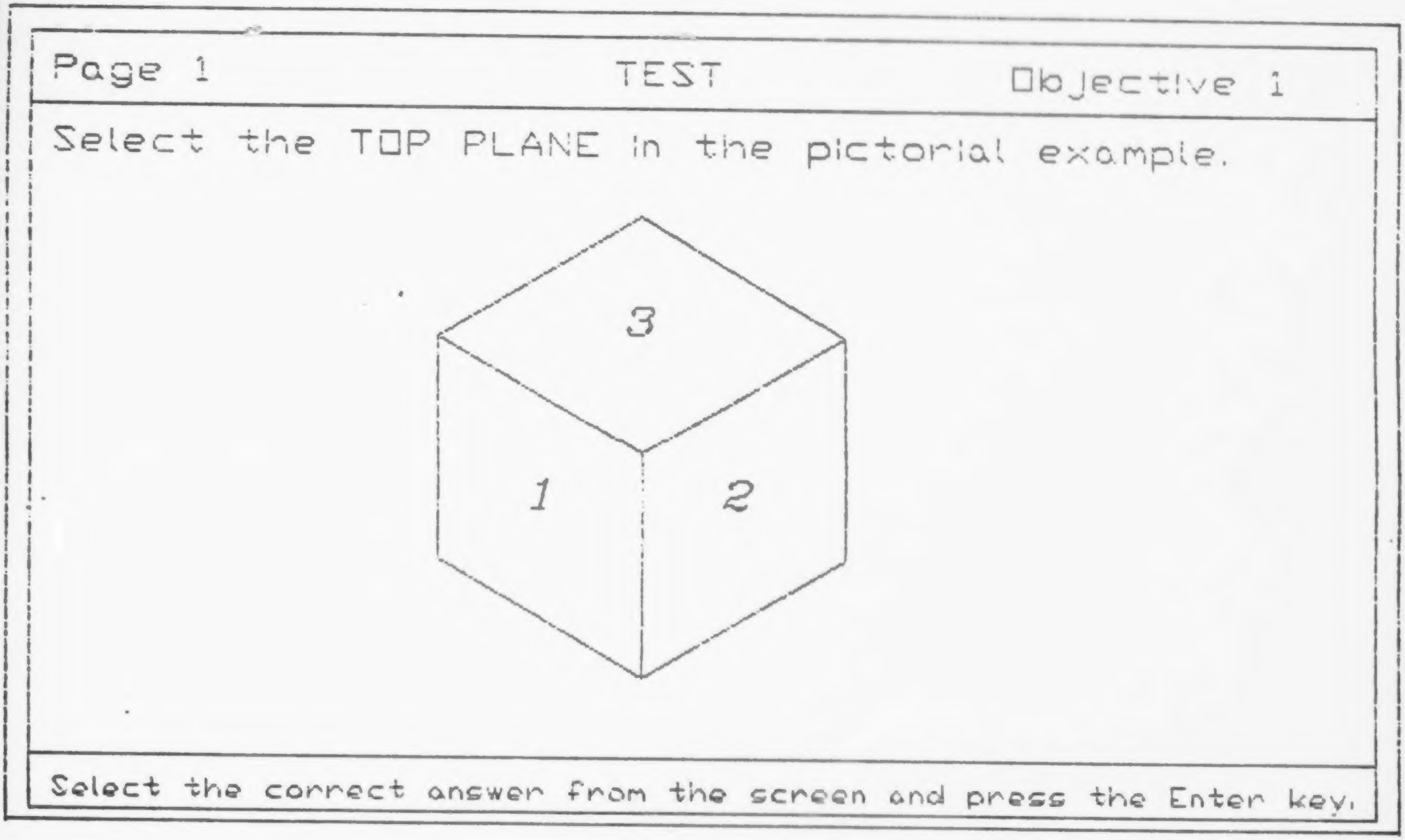


Page 9 PRACTICE OBJECTIVE 4

Select the missing line to complete the Front view.

Top
1.50
?
1.50
Front
Side
MISSING LINES

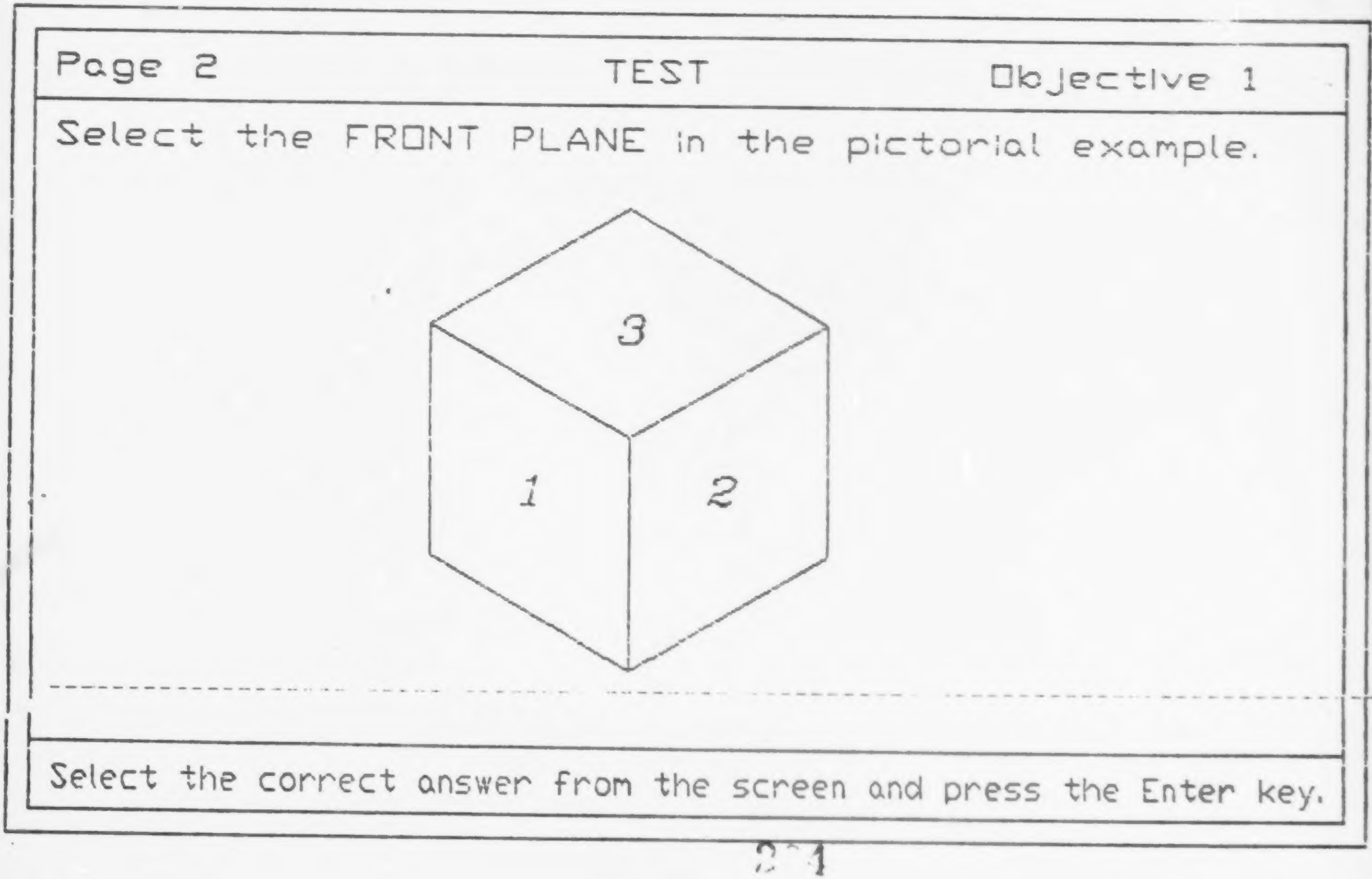
Select the correct answer from the screen and press the Enter key.



Page 1 TEST Objective 1

Select the TOP PLANE in the pictorial example.

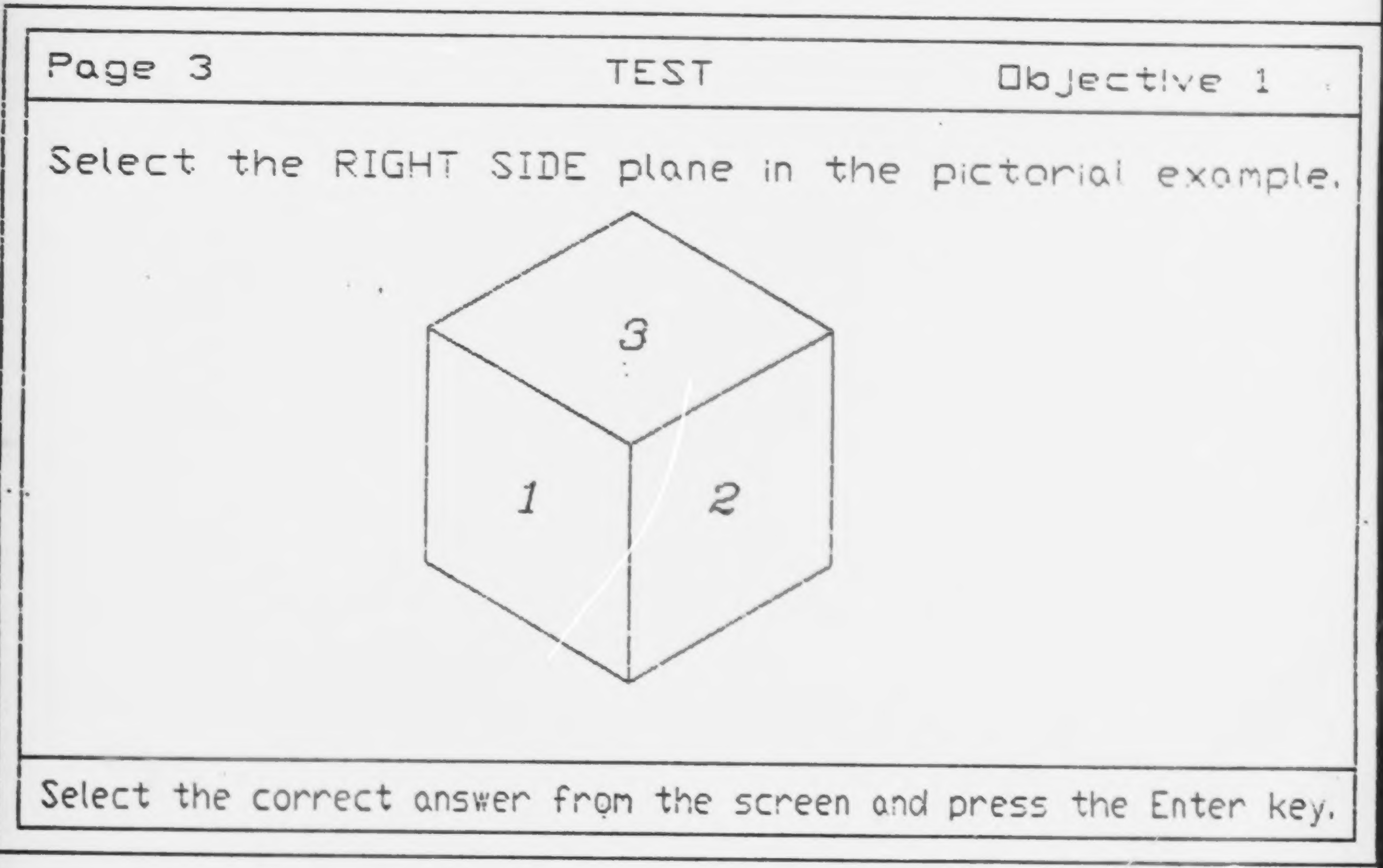
Select the correct answer from the screen and press the Enter key.



Page 2 TEST Objective 1

Select the FRONT PLANE in the pictorial example.

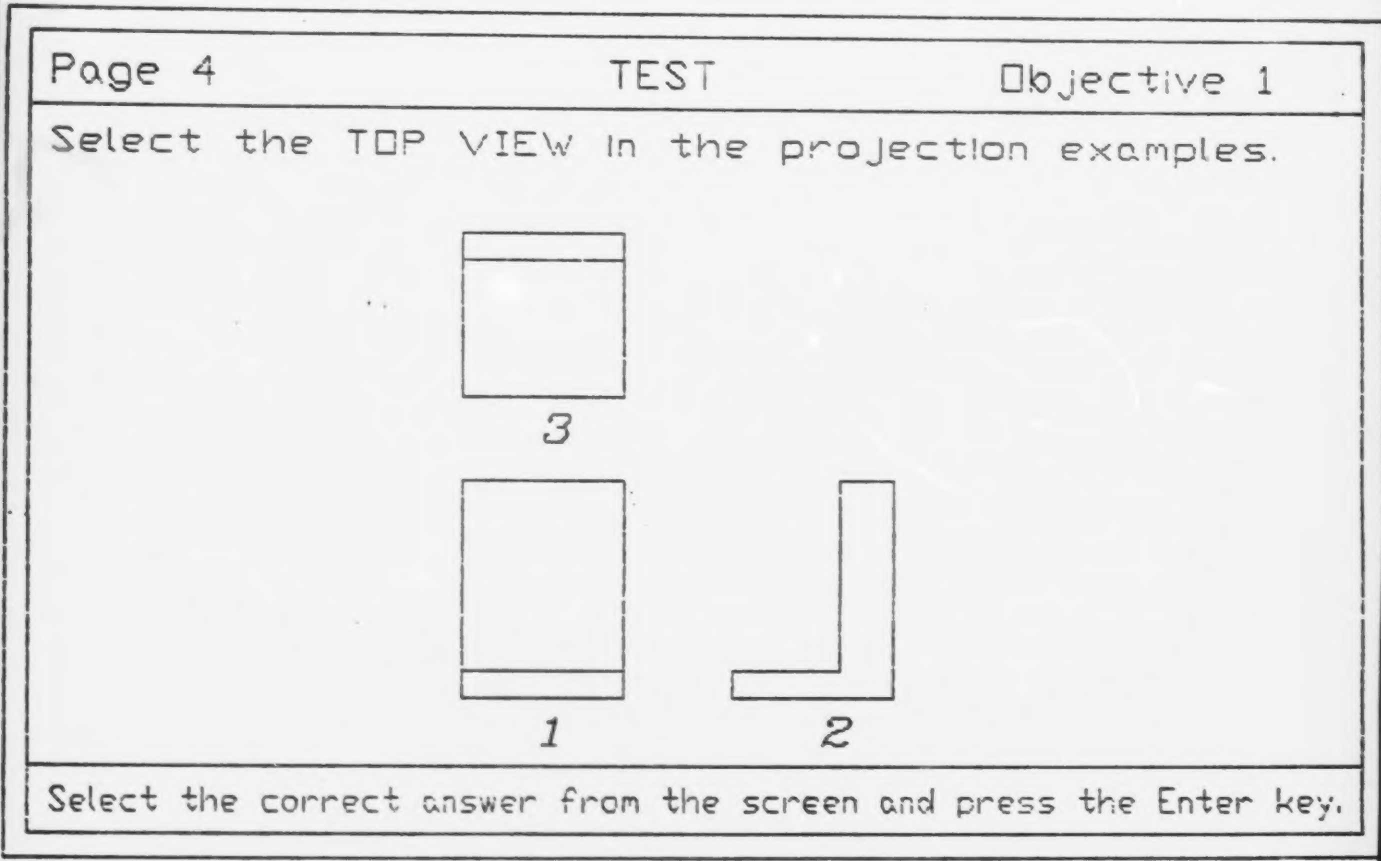
Select the correct answer from the screen and press the Enter key.



Page 3 TEST Objective 1

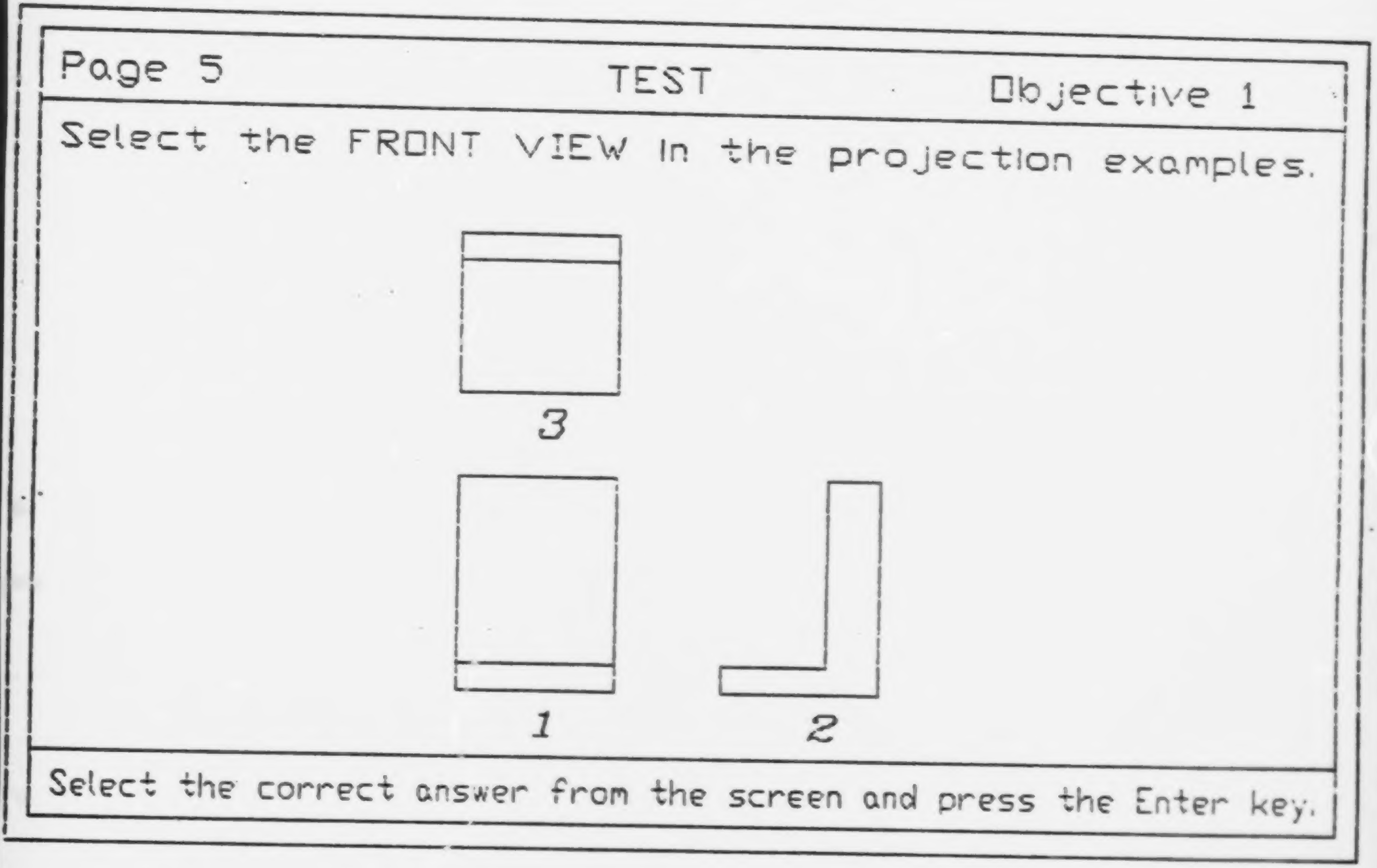
Select the RIGHT SIDE plane in the pictorial example.

Select the correct answer from the screen and press the Enter key.


Page 4 TEST Objective 1

Select the TOP VIEW in the projection examples.

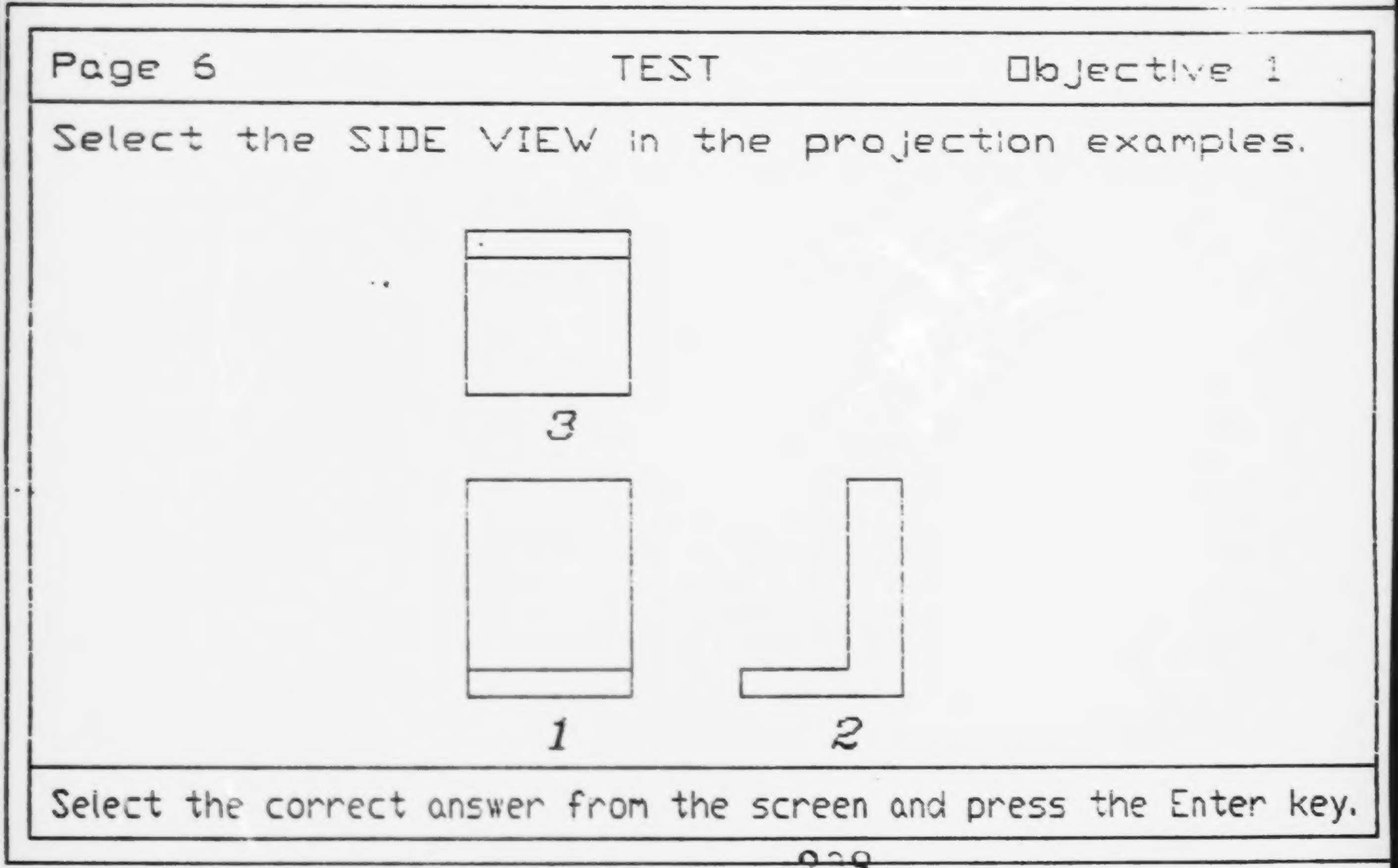
Select the correct answer from the screen and press the Enter key.



Page 5 TEST Objective 1

Select the FRONT VIEW in the projection examples.

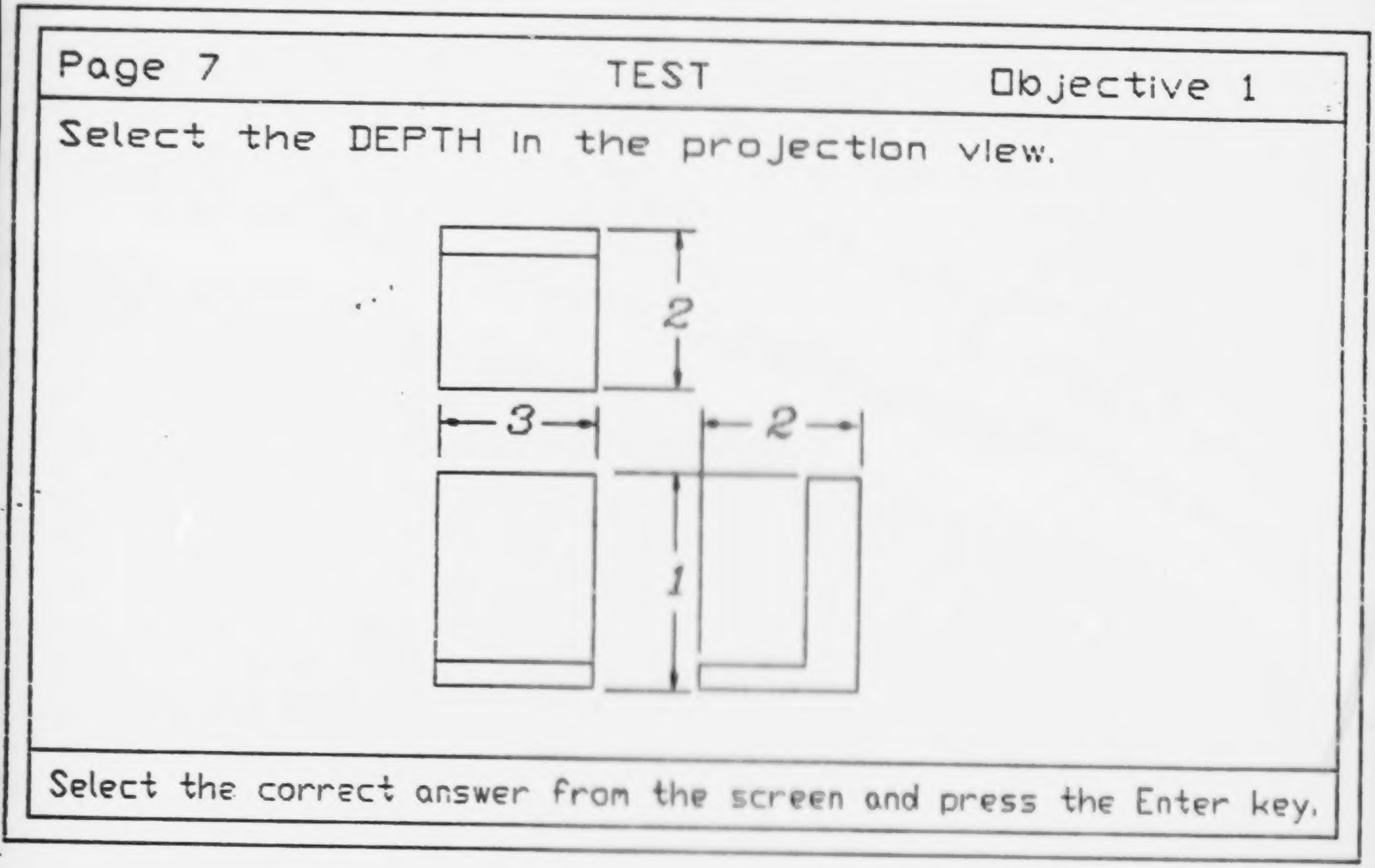
Select the correct answer from the screen and press the Enter key.



Page 6 TEST Objective 1

Select the SIDE VIEW in the projection examples.

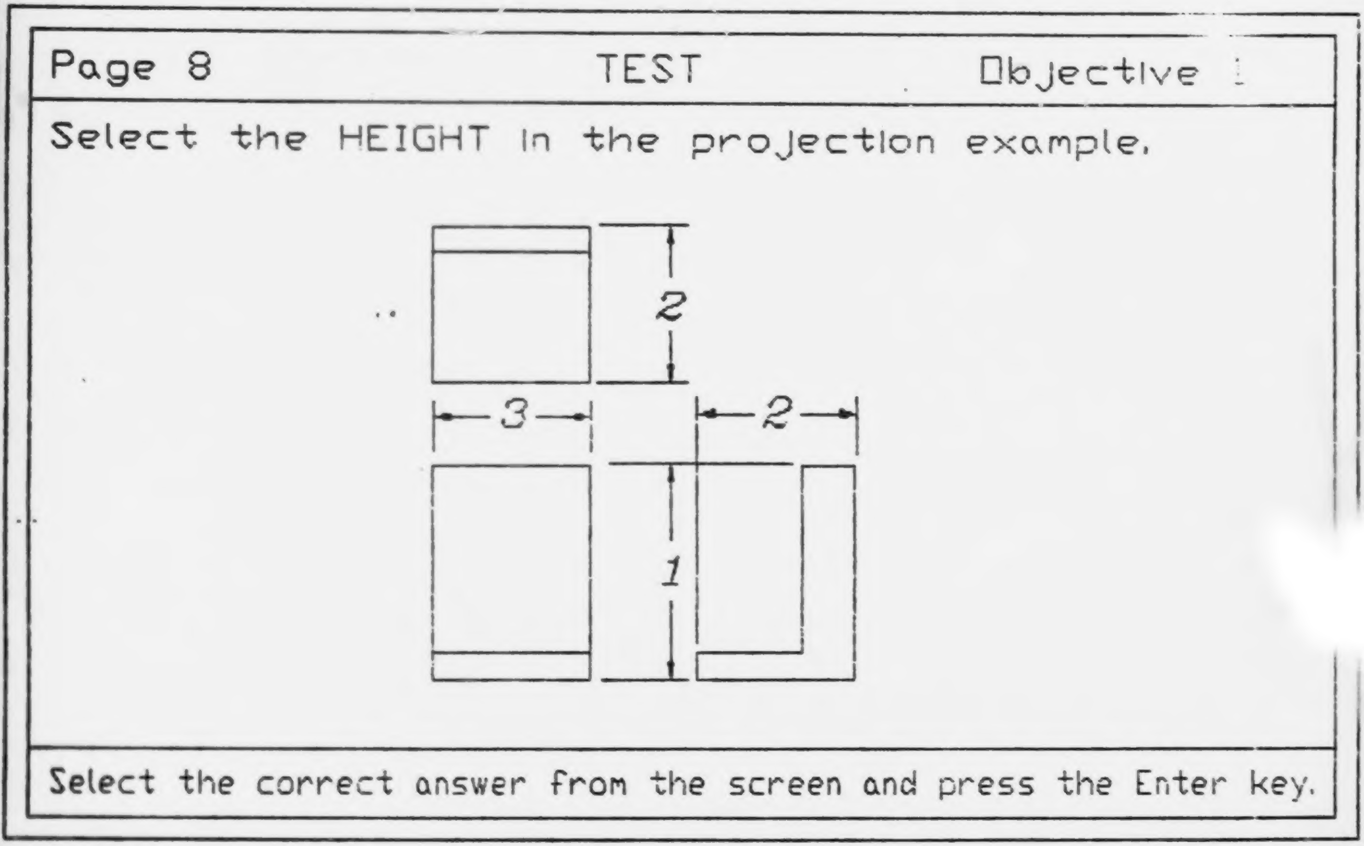
Select the correct answer from the screen and press the Enter key.



Page 7 TEST Objective 1

Select the DEPTH in the projection view.

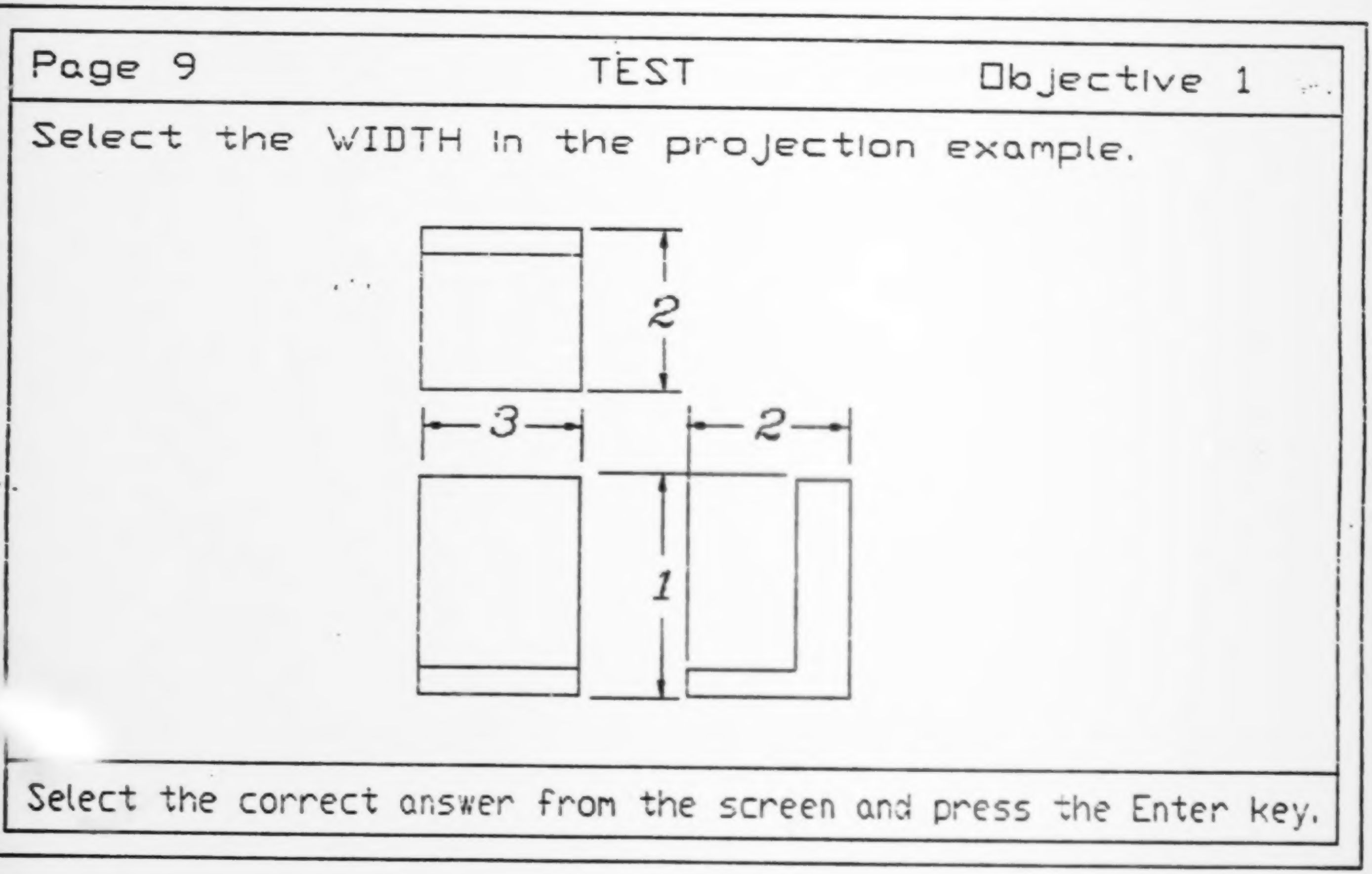
Select the correct answer from the screen and press the Enter key.



Page 8 TEST Objective 1

Select the HEIGHT in the projection example.

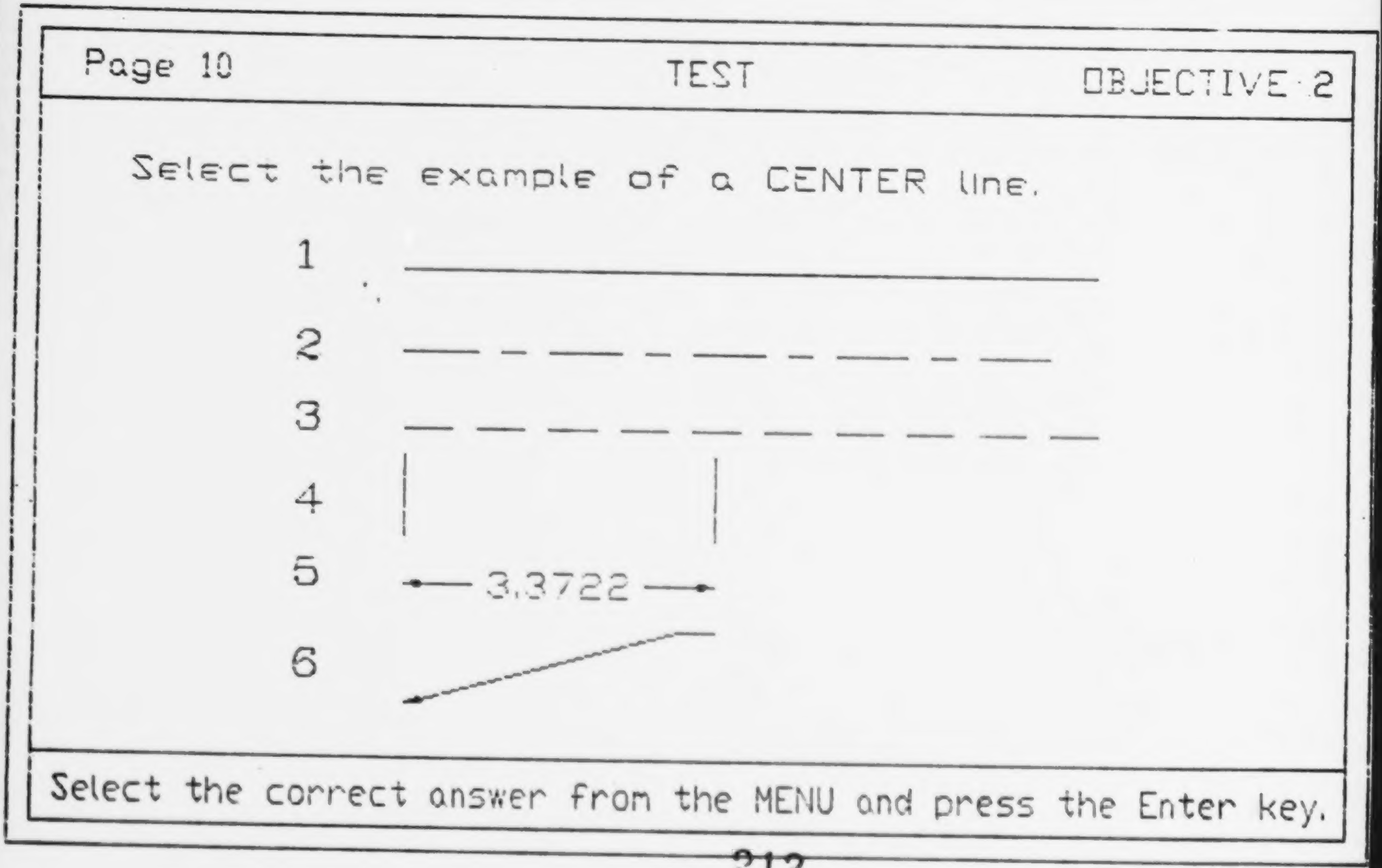
Select the correct answer from the screen and press the Enter key.



Page 9 TEST Objective 1

Select the WIDTH in the projection example.

Select the correct answer from the screen and press the Enter key.



Page 10 TEST OBJECTIVE 2

Select the example of a CENTER line.

1

2

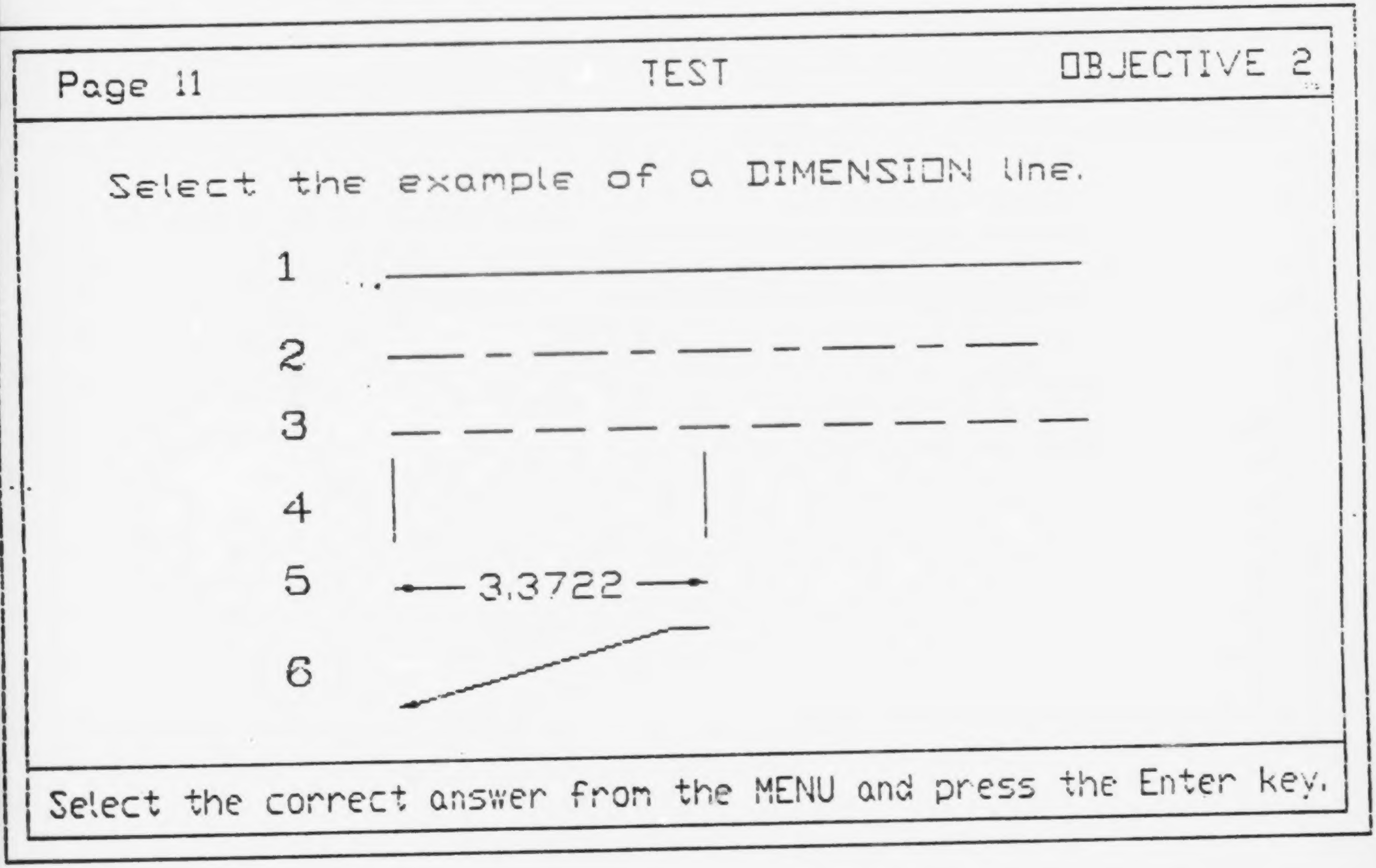
3

4

5 3.3722

6

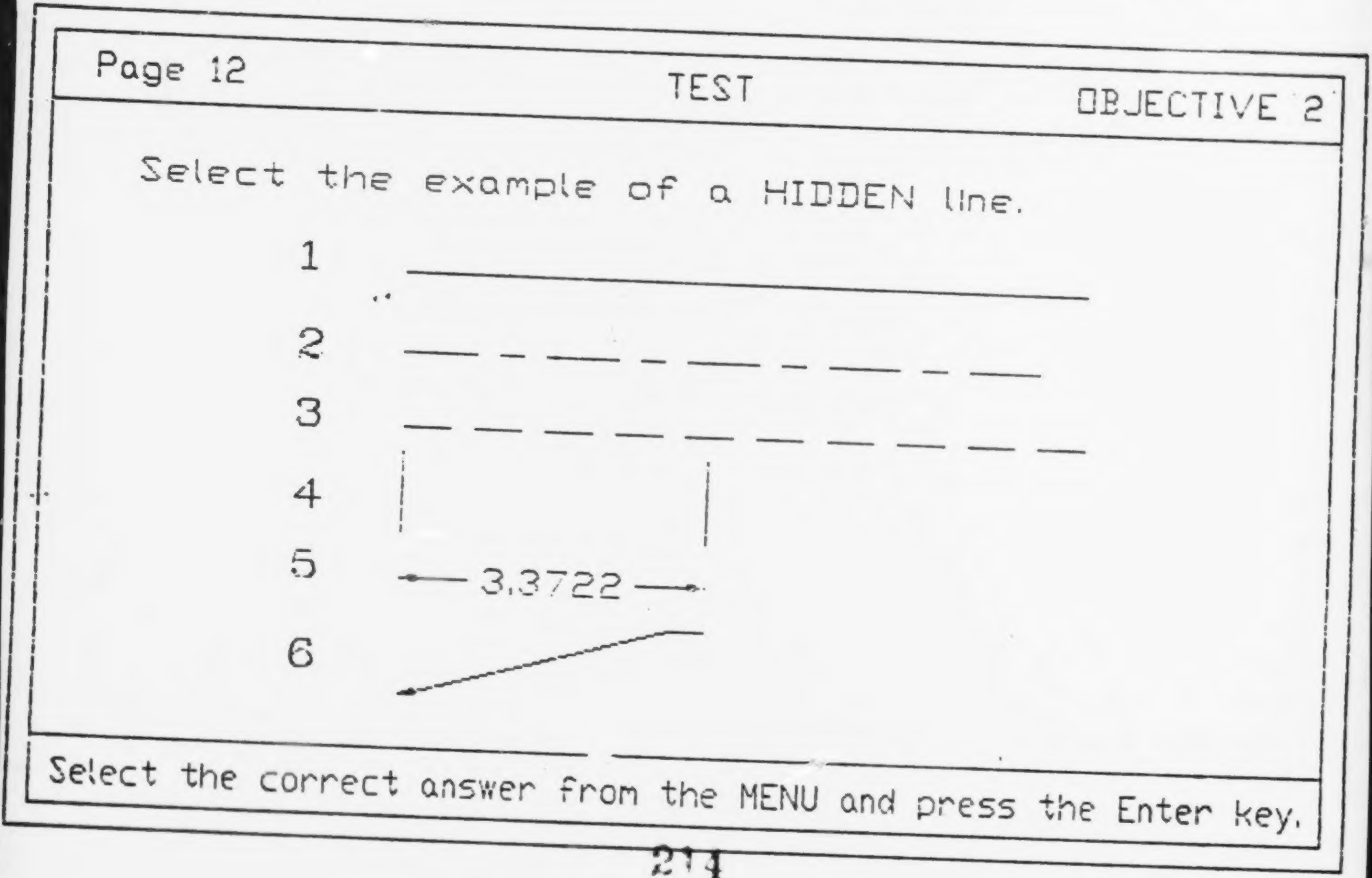
Select the correct answer from the MENU and press the Enter key.



Page 11 TEST OBJECTIVE 2

Select the example of a DIMENSION line.

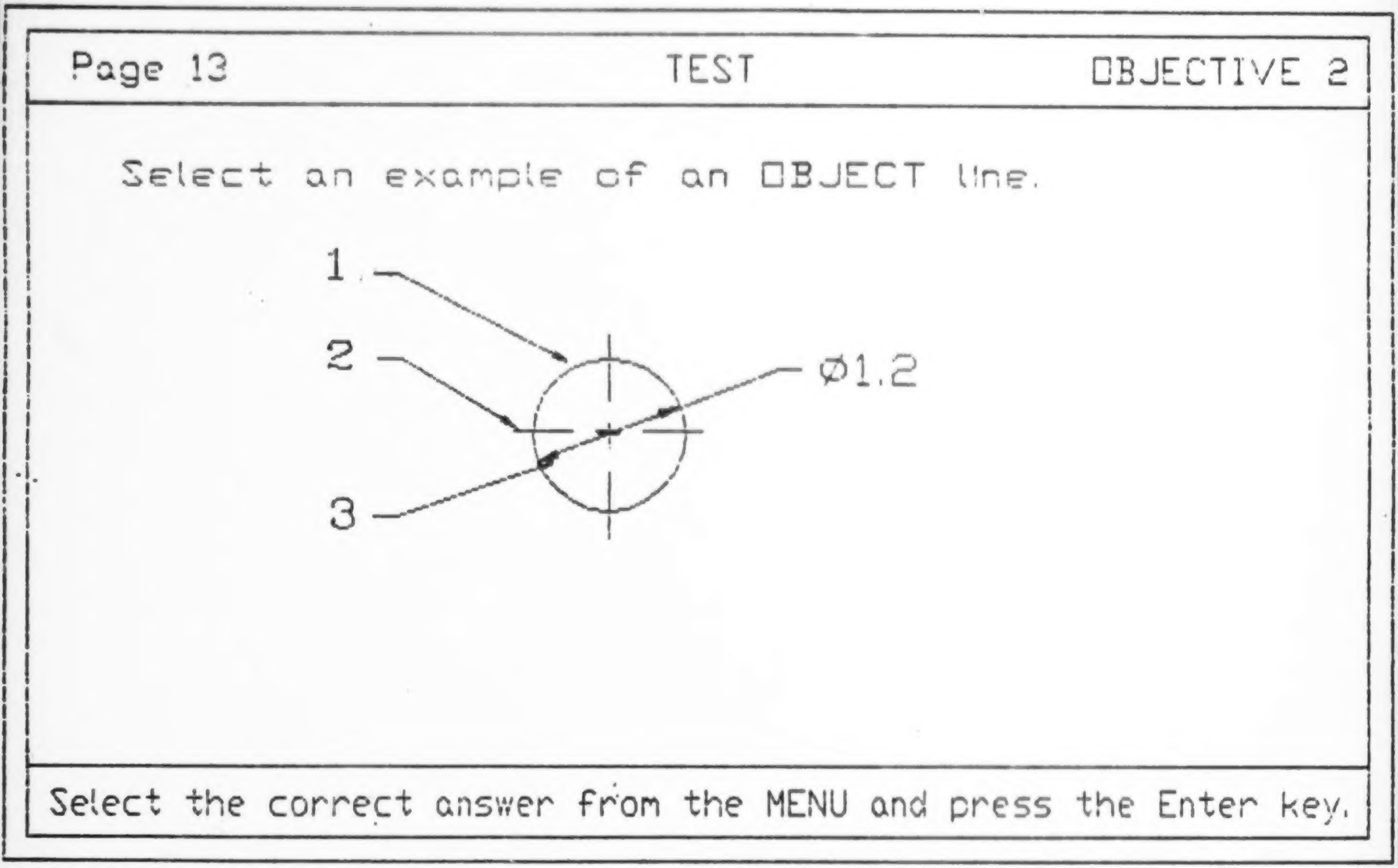
Select the correct answer from the MENU and press the Enter key.



Page 12 TEST OBJECTIVE 2

Select the example of a HIDDEN line.

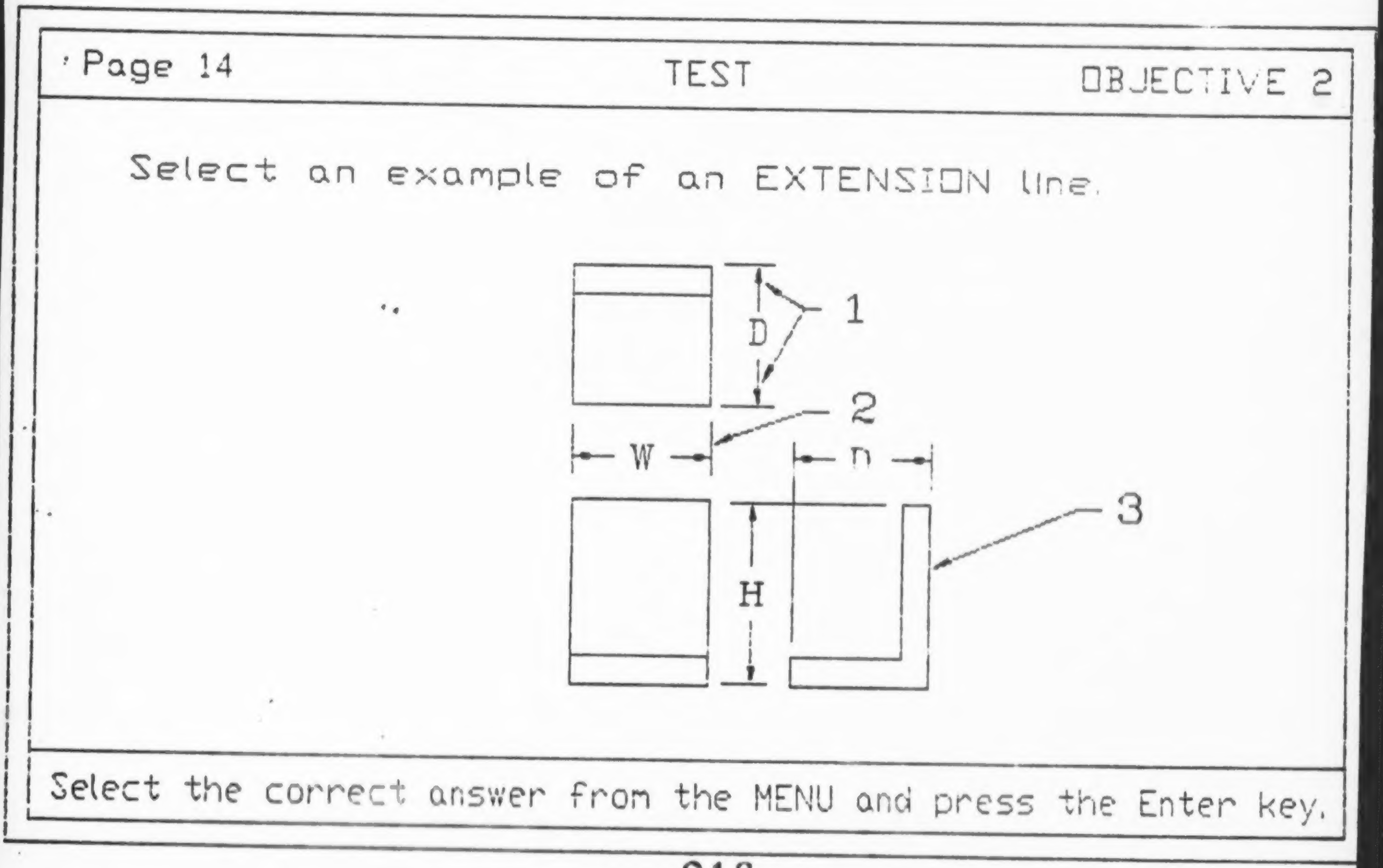
Select the correct answer from the MENU and press the Enter key.



Page 13 TEST OBJECTIVE 2

Select an example of an OBJECT line.

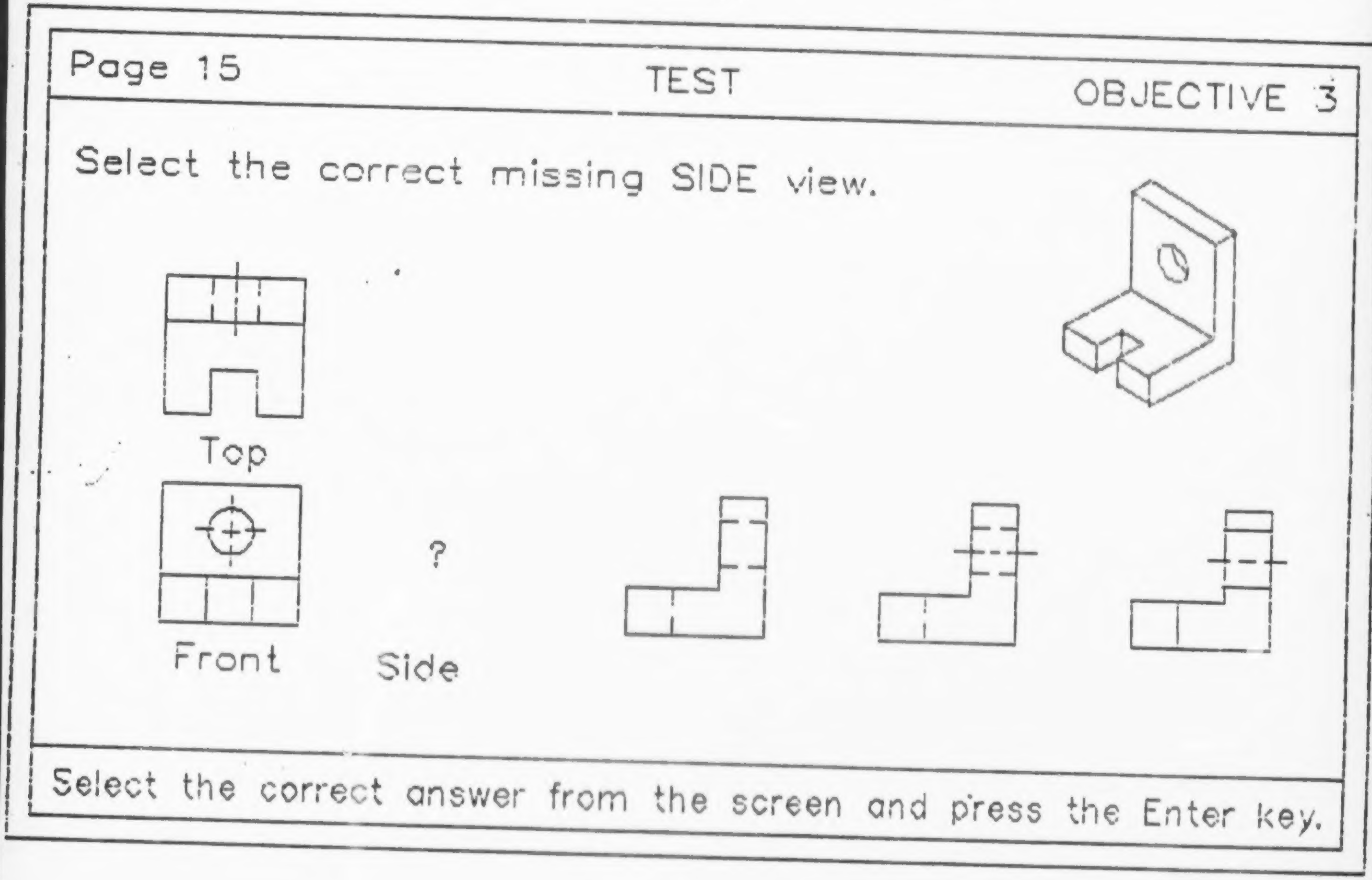
Select the correct answer from the MENU and press the Enter key.



Page 14 TEST OBJECTIVE 2

Select an example of an EXTENSION line.

Select the correct answer from the MENU and press the Enter key.

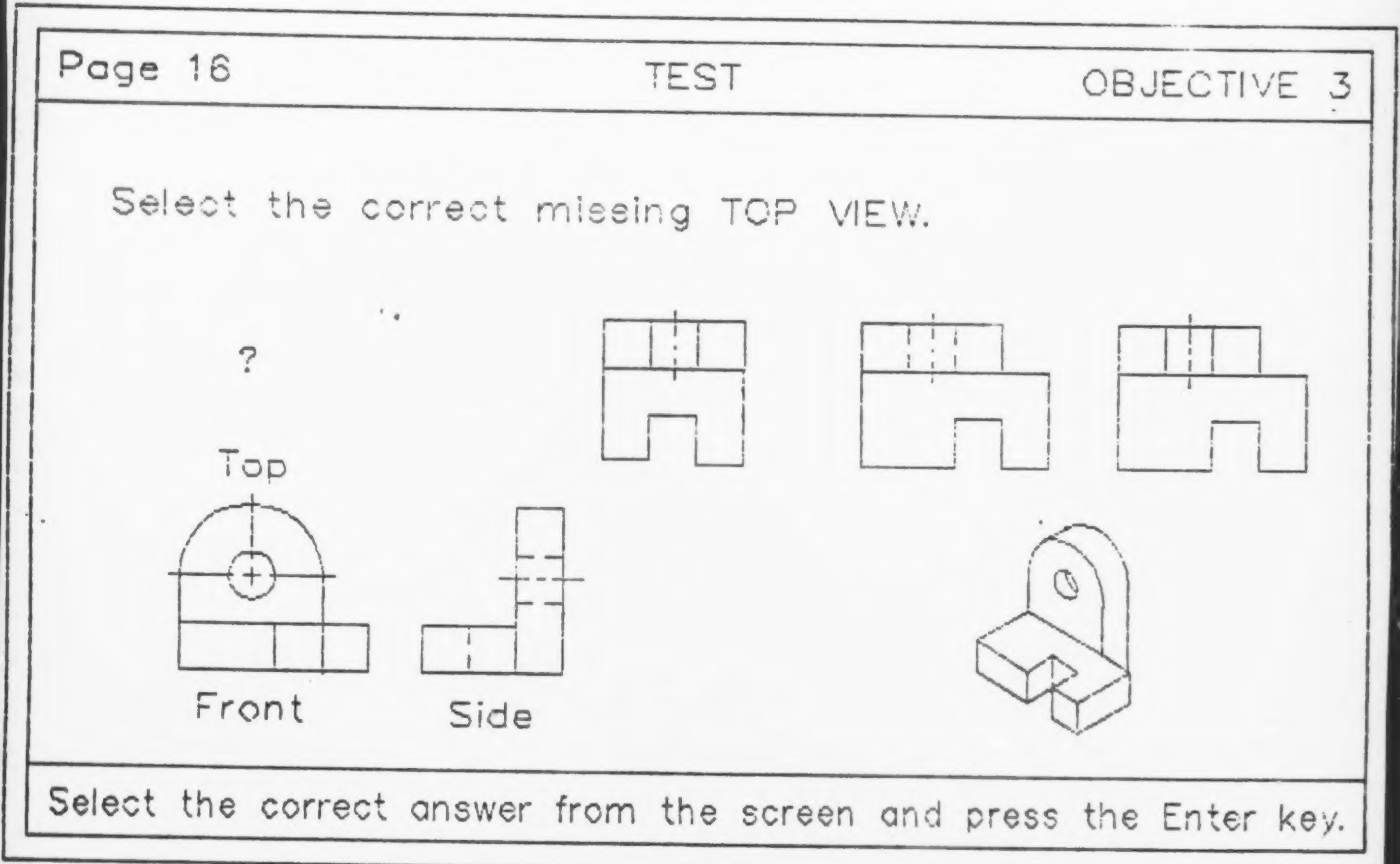


Page 15 TEST OBJECTIVE 3

Select the correct missing SIDE view.

Top
Front
?
Side

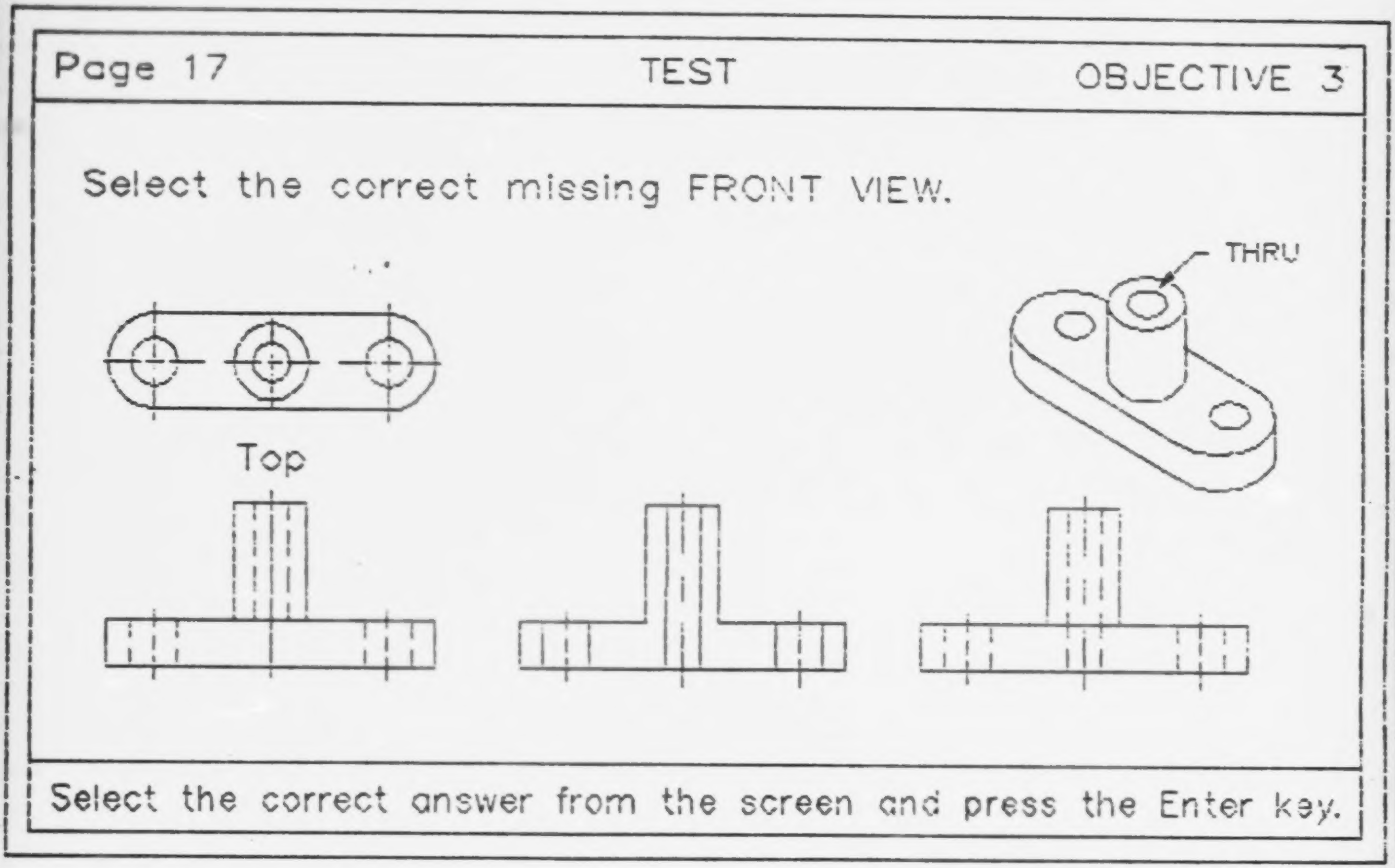
Select the correct answer from the screen and press the Enter key.


?
Top
Front
Side

Page 16 TEST OBJECTIVE 3

Select the correct missing TOP VIEW.

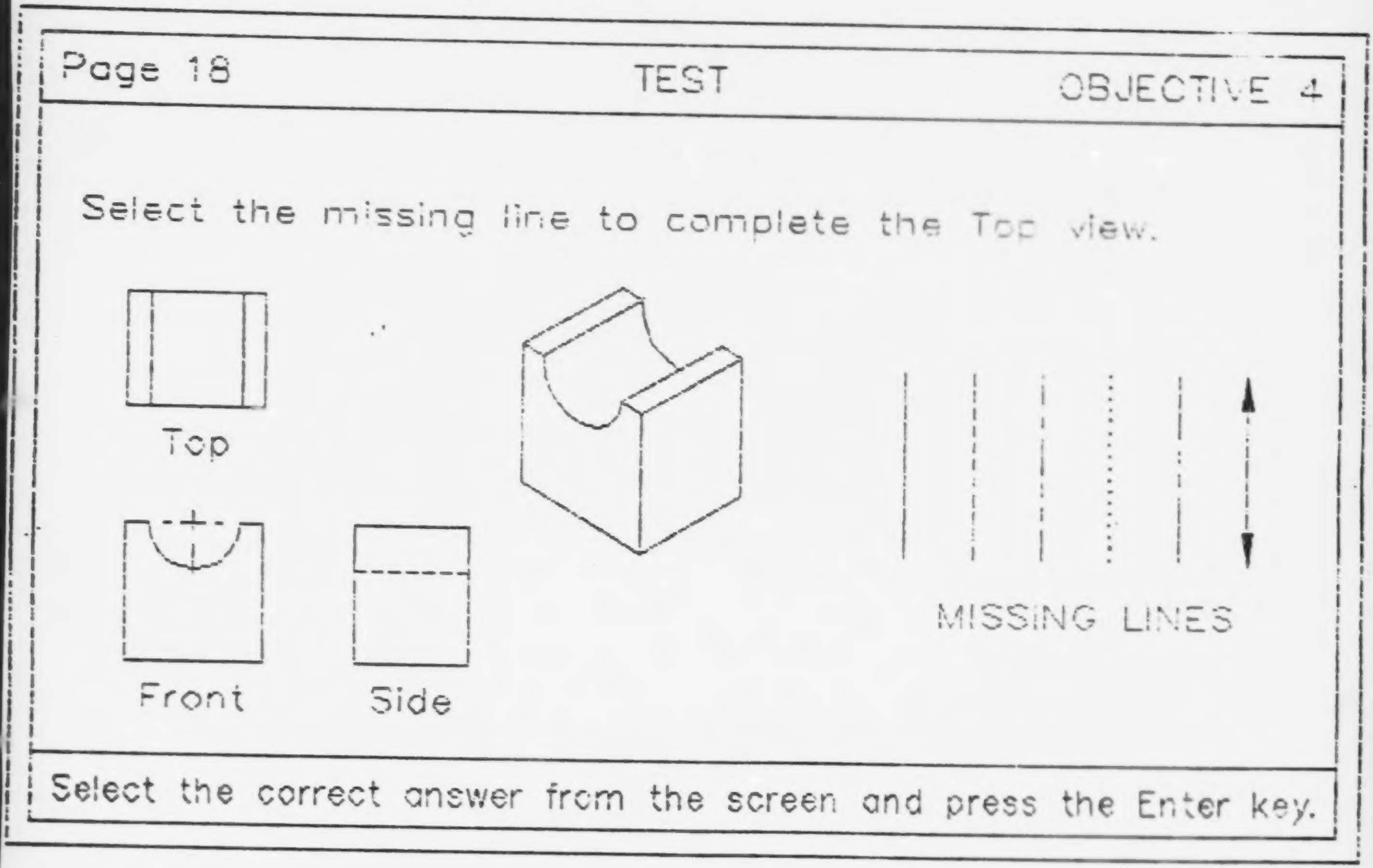
Select the correct answer from the screen and press the Enter key.



Page 17 TEST OBJECTIVE 3

Select the correct missing FRONT VIEW.

Select the correct answer from the screen and press the Enter key.

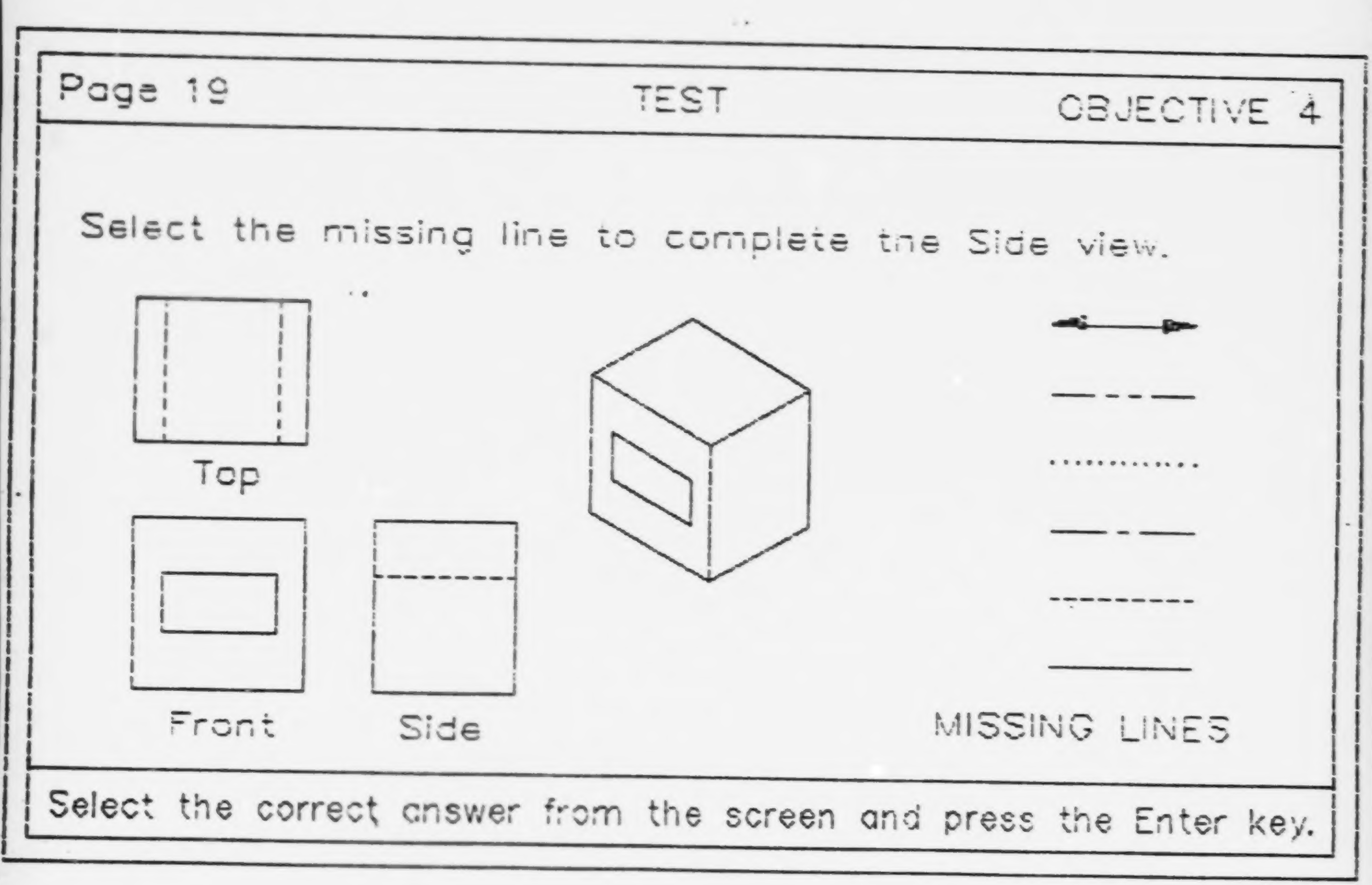


Page 18 TEST OBJECTIVE 4

Select the missing line to complete the Top view.

Top
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.

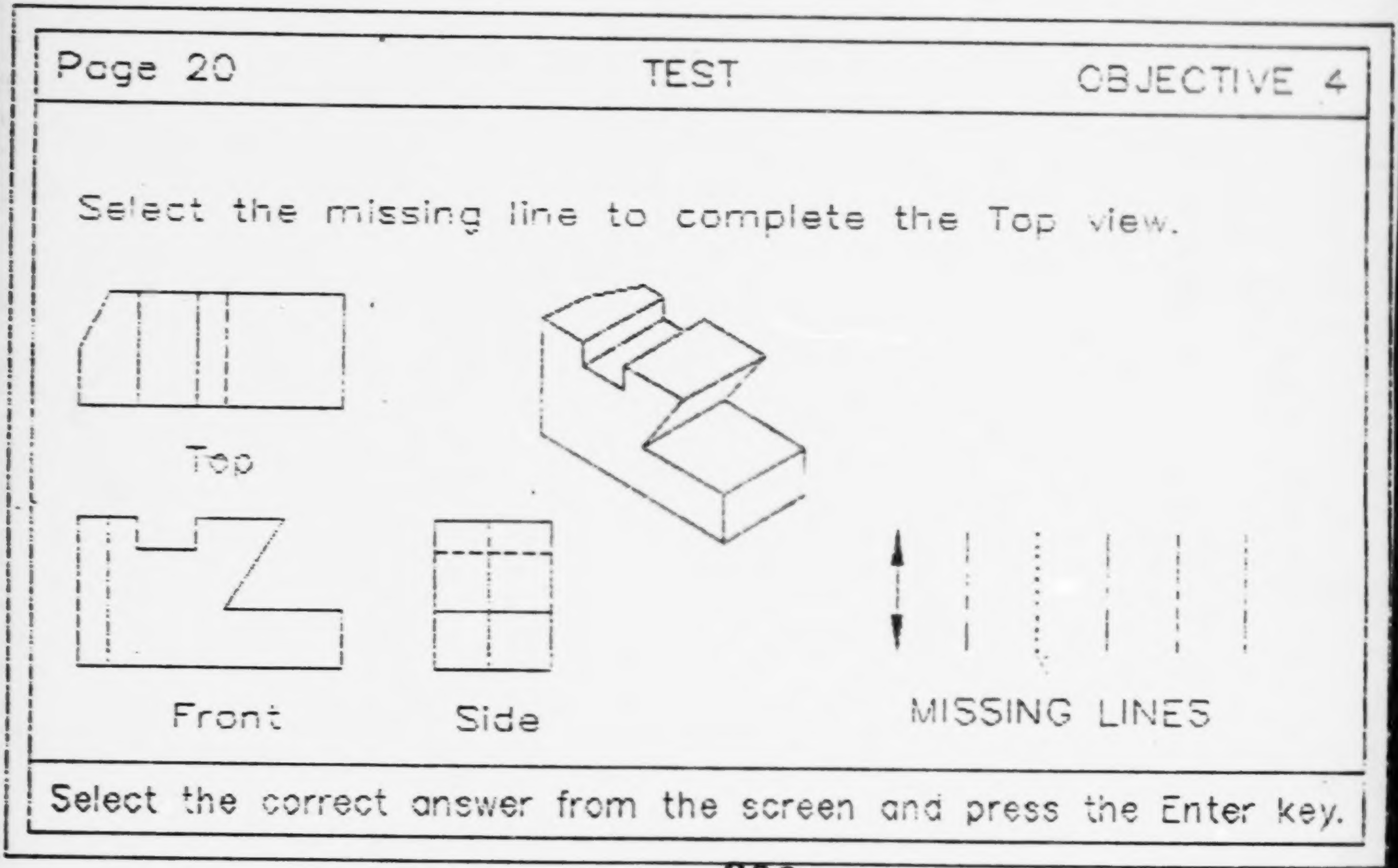


Page 19 TEST OBJECTIVE 4

Select the missing line to complete the Side view.

Top
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.



Page 20 TEST OBJECTIVE 4

Select the missing line to complete the Top view.

Top
Front
Side
MISSING LINES

Select the correct answer from the screen and press the Enter key.